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STATION, RADIO, A14

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

This EMER must be read in conjunction with Tels F 162 Part 2 which contains figures and tables to which reference is made.

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INTRODUCTION

General

1. This regulation is divided into six separate sections dealing with the following major components of the station.

Section 1 - Transmitter - receiver, radio, A14 (TRA14)
Section 2 - Tuner, r.f. antennae (t.r.f.)
Section 3 - Hand generator
Section 4 - Remote control units "L" and "R"
Section 5 - 12/24V d.c. battery charger
Section 6 - Ancillaries

2. Testing is based on the use of the Test kit, radio, TRA14 which is separately described in EMER Tels M 332. Table 14 details all the test equipment required.

3. The station contains many transistors, all of which can be permanently damaged by the connection of voltages which are excessive or of reversed polarity. The test kit and station equipments have been designed to avoid damage should a mistake be made but the greatest care must be exercised at all times. Before commencing to service the equipment read EMER Tels A 412 and note in particular that the improper use of an ohmmeter can have disastrous consequences.

Lubricants and sealing compounds

4. The following items will require lubrication and/or sealing:-

a. All spindle seals and mechanical bearings should be lightly smeared with Grease XG290, 4 oz tubes, H1/9150-99-910-5057.

b. Rubber sleeves such as those used on headsets should be lightly smeared with silicon compound, Releasil 7, 2 oz tubes, H1/6850-99-943-3472. This may also be applied sparingly to cords which have to be threaded through rubber sleeves, grommets etc.

c. Screws, nuts etc should be lightly coated with Dulux red, varnish insulating, anti-tracking, air-drying, 1/2-pt tins, H1/8010-99-942-8917.

d. The sleeves of pigmy plugs and sockets require the use of a sealing compound. The correct compound is Loctite A sealing compound, 10cc and 50cc containers, H1/8030-99-220-2387 and H1/8030-99-220-2874 respectively.

e. Where power-type transistors are mounted on heat sinks or chassis using mica or anodised insulating spacers, the spacers should be coated on both sides with a thin film of Grease silicone compound MS4, 2 oz tubes H1/6850-99-220-2421. This gives an improved heat-transfer path.

f. The main sealing gaskets between front panels and cases should be lubricated as detailed in the drying and sealing instructions for each unit. The use of the correct lubricant is important as it prevents corrosion when dissimilar metals are present.

Repair policy

5. The repair policy for this equipment is as follows:-

a. Unit repairs will be confined to those parts which do not involve the opening of the sealed set. Items which are provided for replacement at unit level are listed in Tels F 163. No internal repairs are to be attempted.

b. Field and Intermediate repairs will normally be confined to:-

(1) The exchange of faulty modules in the transmitter/receiver. (The tuner, r.f.; amplifier, r.f.; and remote control units are to be repaired by replacement of components).

(2) The exchange of components which are not mounted on modules. (Gear drives, shafts, gang capacitors and cableforms will be replaced only during base repair).

(3) The alignment and specification testing of the set and ancillaries using the test equipment listed in Table 14.

c. Faulty modules will be packed to prevent damage during transit and will be backloaded to specified workshops.

d. Base repairs will consist of:-

(1) The repair of sets arising for Base repair/overhaul in the normal manner.

(2) All sets which need the replacement of mechanical drives, gang capacitors or cableforms.

(3) The repair, test and alignment of individual modules. This will be carried out only in those workshops which have been specifically designated to carry out such repairs and which are in the possession of the special factory type test gear.

Coding and indentification data

6. The following abbreviation codes are used:-

BK	- Black	V	- Violet
BN	- Brown	GY	- Grey
RR	- Red	W	- White
O	- Orange	P	- Pink

Y	- Yellow	CC	- Centre connector
G	- Green	P/V	- Pink wire/violet sleeve
B	- Blue	B/G	- Blue wire/Green sleeve
A	- Module A	T	- Terminal (Red)
B	- Module B	TP	- Test point (Yellow)
C	- Module C	CFTB	- Cableform terminal board
D	- Module D	K3	- Module K terminal 3
E	- Module E		
F	- Module F		
G	- Module G		
J	- Module J		
K	- Module K		
L	- Module L		
M	- Module M		
N	- Module N		

7. Transistors, where necessary, have their leads colour-coded as follows:-

	NPN	PNP
Collector	Pink	Violet
Base	Yellow	Yellow
Emitter	Blue	Orange

SECTION 1 - TRANSMITTER-RECEIVER A14

GENERAL

8. The information contained in this section deals with the repair, adjustment and testing of T.R.A.14 in its entirety. Details of the repair and testing of the modules will be issued only to those workshops which are issued with the special-to-type module test equipment.

INSTRUCTION FOR DRYING AND SEALING

9. On receipt for repair the set is to be pressurised to 5 lb sq in. and a dip test carried out in a water tank using a small amount of wetting agent if available. This should reveal any leaky spindle seals, casting pin holes etc. The inspection must be thorough with the set immersed for at least five minutes.

10. Dry externally, then open the set in the driest possible conditions.

11. Carry out functional checks and all necessary repairs and adjustments.

12. The set, removed from its case, must now be placed in the oven, drying, tels and dried for 30 minutes at 50°C with the dry air from the pump unit passing through the oven (see EMER Tels M 602)

13. After cooling, the set must be electrically tested, and aligned if necessary.

14. Before re-sealing the set into its case fit a reactivated 1.1/4 in. silica gel desiccator (4440-99-942-2061). The sealing gasket should be smeared with Grease silicon compound MS4.

15. Remove the seal-testing plug and fit the appropriate adaptor from the leak locator.

16. The set is now pressurised to 2.5 lb/sq in. using dry air from the oven drying to pressurise the unit.

17. After a period of 48 hours the pressure should not have reduced below 2.2 lb/sq in. (after applying temperature/pressure correction as detailed in Tels M 631). The T.R.A.14 has a time-constant of 375 hours.

18. Finally remove the sealing adaptor, lightly smear the sealing ring on seal testing plug with Grease, silicon compound MS4 and screw plug firmly into case.

19. This same procedure should be used when seal testing the amplifier r.f.

MECHANICAL REPAIRS AND REPLACEMENTS

To remove the panel and chassis assembly from case

20. Using a 3/32 in. AF wrench, slacken to their full extent the seven socket-headed captive screws round the periphery of the front panel.

21. Turn the equipment on to its side and carefully ease the panel and chassis assembly from the case until the 14-way connector is accessible. Remove the connector and fully withdraw the assembly from the case.

To remove components from the front panel

22. Most front panel components can be removed without detaching the front panel; a limited removal of adjacent modules in most cases permits access.

23. Instructions are given in Table 1 in a sequence which follows the order of increasing complexity. See EMER Tels F 162 Part 2 for details of modules and assemblies.

Table 1 - Component removal Module A

Component	Removal procedure	Notes
Sockets B and C	These are completely accessible via the crystal compartment	
Meter	a. Unsolder the two wires from the meter terminals noting that the orange wire with the red sleeve goes to the positive inboard terminal	
	b. Using the special spanner release the ring nut from the meter and remove the meter.	For details of spanner see fig 12.
MR14 and MR15	Remove Module B to give complete access	

Table 1 - (cont)

Component	Removal procedure	Notes
ILP1 and ILP2	a. Remove the tuning scale b. Release the hexagon-headed screw securing the lampholder assembly. c. Unsolder the leads from the bulb and remove.	
BAND-switch drive mechanism	a. Remove the tuning scale and Module L. b. Remove the BAND-switch knob. c. Release and remove the nut and washer securing the switch mechanism to the front panel d. Remove the mechanism complete with the shaft coupler.	
GAIN control RV6	a. Unsolder the three wires from RV6 b. Remove the knob c. Release and remove the nut and washer securing RV6 to the front panel d. Remove RV6	
R.F. Trim control C65	a. Refer to removal of complete front panel and carry out operations a to e only (later in this table) b. Remove the knob c. Unsolder the two black wires from the rotor of C65 d. Release and remove the nut and washer securing C65 to the front panel. e. Remove C65 and unsolder the red wire from the stator tag.	On re-assembly set the rotor of C65 so that the vanes are half-on meshed. Then fit the knob with the pointer adjacent to the white spot on the front panel

Table 1 - (cont)

Component	Removal procedure	Notes
System switch SWB	a. Refer to removal of the complete front panel and carry out operations a to e only. b. Unsolder the wires from SWB c. Remove the knob d. Release and remove the nut and washer securing the switch to the front panel. e. Remove SWB.	On re-assembly refer to Fig 2520 for connections to SWB
CHANNEL switch SWC	a. Refer to removal of the complete front panel and carry out operations a to e only b. Remove the knob c. Release and remove the nut and washer securing the switch to the front panel d. Unsolder the wires from SWC e. Remove SWC	On re-assembly refer to Fig 2521 for connections to SWC
C.W. TONE control RV8	a. Release module F securing screws. b. Unsolder the three wires from RV8 c. Remove the knob d. Release and remove the nut and washer securing RV8 to the front panel e. Remove RV8	
Complete front panel	a. Remove the tuning scale b. Disconnect the coupling into the variable capacitor cage at the front panel end.	

Table 1 - (cont)

Component	Removal procedure	Notes
	c. Disconnect the coupling to the BAND switch at the module L side d. Unsolder all wire links between CFTB3 and the system switch terminal board e. Unsolder the following wires all of which are additionally identified by a long yellow sleeve:- (1) Orange wire from module L, terminal 1. (2) Yellow wire from module L, terminal 9. (3) Yellow wire with violet sleeve from module L terminal 3. (4) Black wire from module N, terminal 12. (5) Brown wire from module C, terminal 19. (6) Grey wire from module C, terminal 13. (7) Co-axial lead from module C, terminal 15. (8) Red wire with white sleeve from module N, terminal 3. f. Remove the four socket-headed screws securing the feet of the tuning capacitor and lift the main body of the set away from the front panel. It is advisable to lift the set and hinge it away to the scale window side of the front panel. g. To completely detach the front panel unsolder the following wires:- (1) The four wires of cableform B from terminals 1, 2, 3 and 4 of TB1 (Part of cableform A)	It may be necessary to release the wires from terminals 6, 7 and 8 of Module L to allow access to the coupling. On re-assembly refer to Fig 1 and 2 for connections of Cableform A and B

Table 1 - (cont)

Component	Removal procedure	Notes
	(2) The co-axial and braid leads to the antenna socket SKTA terminals A6 and A7.	

Table 2 - Module A connections

Terminal No	Wire Identification	Service Carried	Destination
A1	Brown	Receiver a.f. to telephones	C19 module
A2	Red	+12V d.c. from BY1 (or BY1 and BY2 when linked)	(PLD-R)CFTB1-2
A3	Violet	Pressel return from RLA (S/R Line)	CFTB1-3
A4	Red (white sleeve)	+12V d.c. from BY2 (or BT1 and BY2 when linked)	(PLD-N)CFTB1-1
A5	Grey	Microphone input to modulator	C13 module
A6	Black	Braid for A7	Braid (A7)
A7	Co-axial centre connector	Antenna connection to RLA/4	K16
A8	Red (white sleeve)	Connection from R.F. TRIM to GA3	N3
A9	Grey	Reactor bias to RLA/2	(K13)CFTB3-17
A10	Grey (green sleeve)	Stab. d.c. volts for B.F.O. potentiometer	(K2)CFTB3-16
A11	Co-axial centre connector	A.F. from RV6 - GAIN control	C15 module
A12	Black	Braid of all	Braid of all
A13	Yellow (violet sleeve)	C148 to Band switch for selection of low band crystals	L3 module
A14	Yellow	C149 to Band switch for selection of high band crystal	L9 module
A15	Red (yellow sleeve)	+12V d.c. supply to crystal oscillator	(K28)CFTB1-4

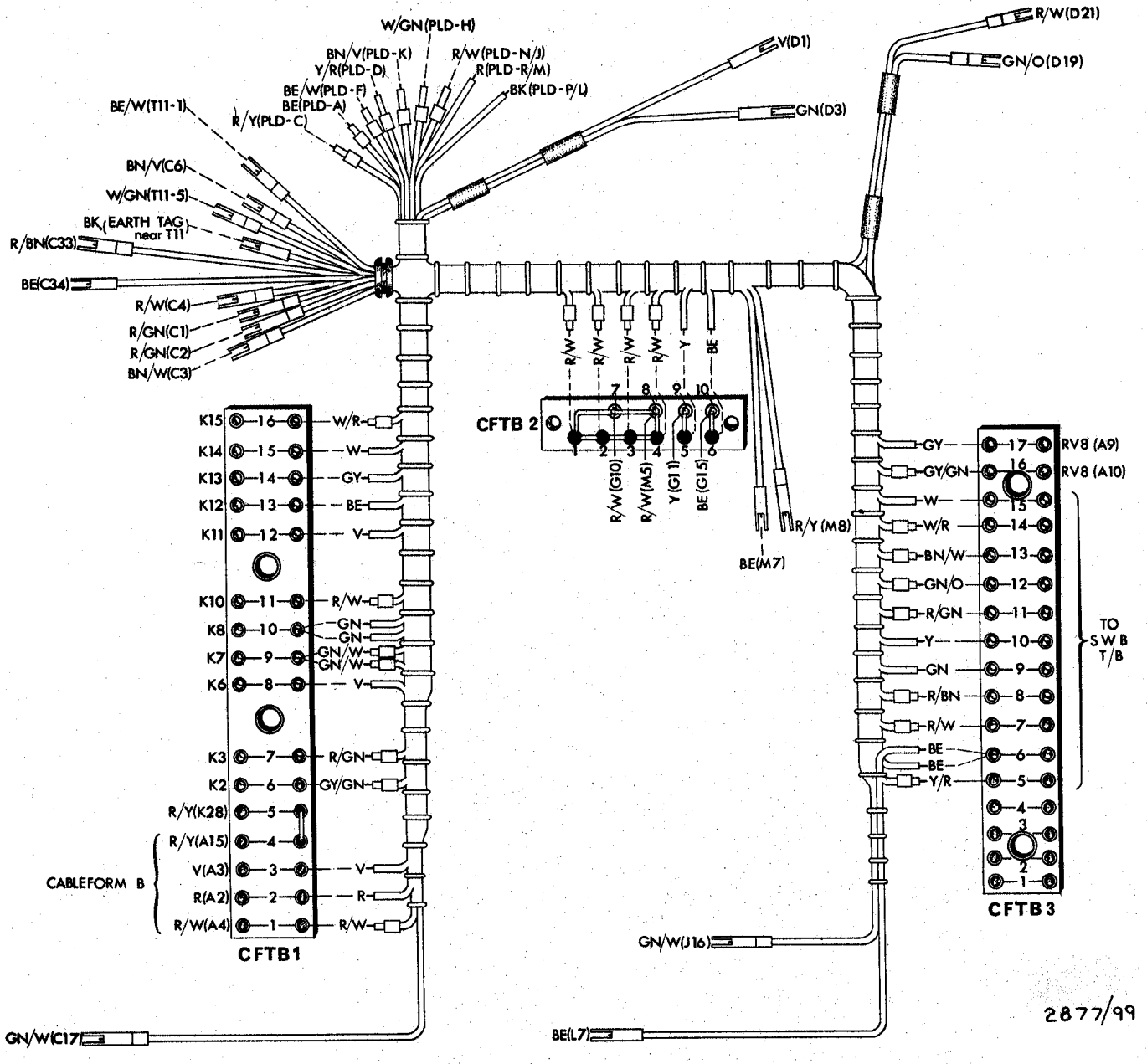

Fig 1 - Cableform A connection details

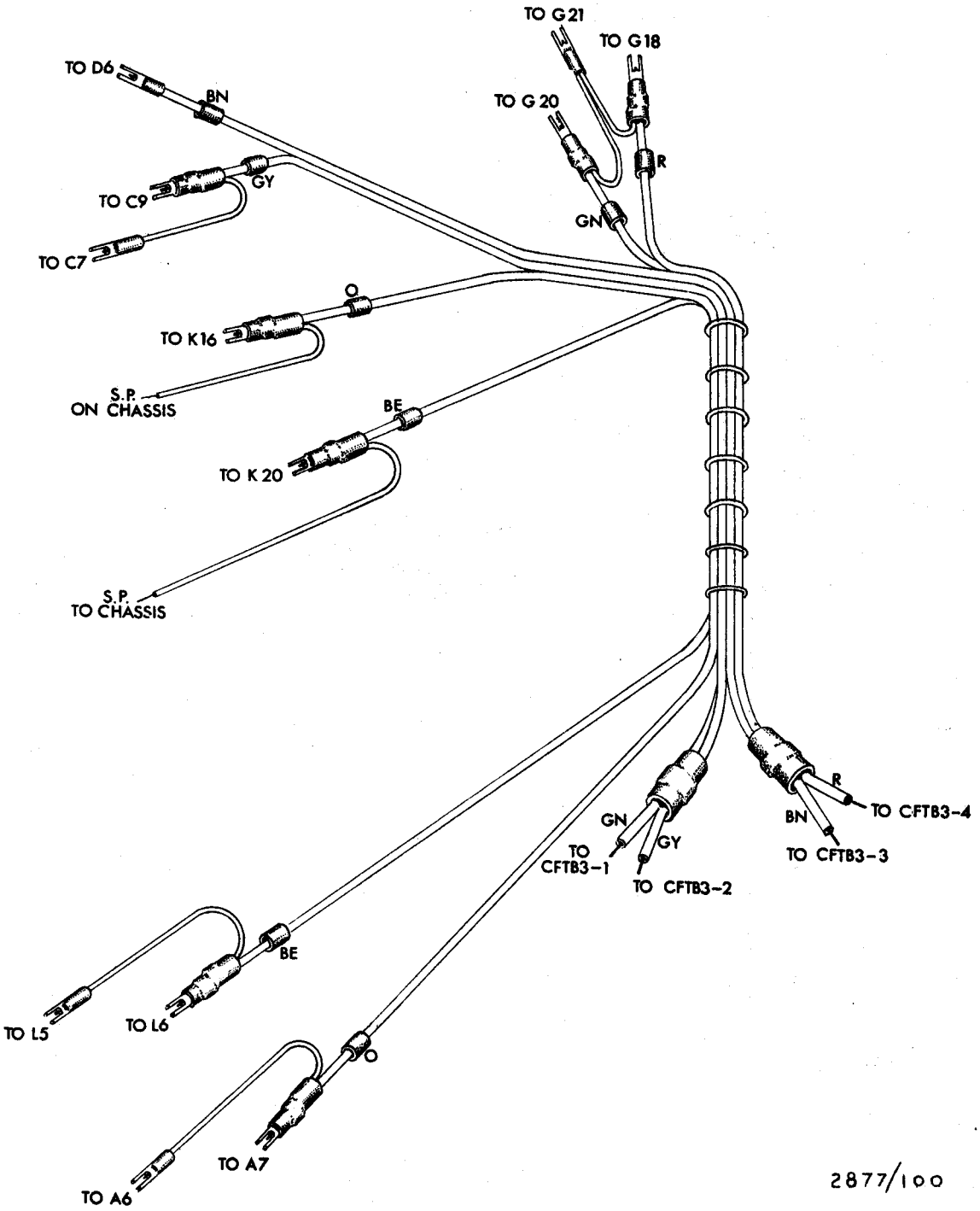

Fig 2 - Co-axial cableform B connection details

Table 2 - (cont)

Terminal No	Wire Identification	Service Carried	Destination
A16	Orange	+12V d.c. supply to free tune oscillator	L1 module
A17	Black	Chassis link from front panel to tuning capacitors assembly	N12

To remove module B

24. a. Unsolder the two co-axial leads to terminals 1, 2, 3 and 4.

b. Release the two socket-headed screws securing the module to the set, and remove the module.

c. To replace, reverse the above procedure observing the correct connections by reference to Table 3.

Table 3 - Module B terminal connections

Terminal No	Wire identification	Service carried	Destination
1	Co-axial centre connector	Input from driver to bases of VT29 and VT30	Module M6
2	Co-axial braid	Chassis connection for braid of co-axial lead to 1	
3	Co-axial centre connector	Output from VT29 and 30 to PA tank circuit	Module L8
4	Co-axial braid	Chassis connection for braid of co-axial lead to 3	

To remove module C

25. a. Unsolder all leads connected to the terminals coded red and red/yellow on the module (see Table 4).

b. Release the four socket-headed screws securing the module to the set and remove the module.

c. To replace, reverse the above procedure observing correct connections by reference to Table 4.

Table 4 - Module C terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test Point No. Yellow	Service monitored
*	Red (green sleeve)	+12V d.c. (VT21) (Transmit and receive)	CFTB3-11	* 1	
2	Red (green sleeve)	(linked to 1)	CFTB1-7		
* 3	Brown (white sleeve)	+12V d.c. (VT19) on Transmit CW	CFTB3-13	* 3	
4	Red (white sleeve)	+12V d.c. to transmitter modulator (on transmit)	CFTB2-2		
				5	Test point for terminal 4
* 6	Brown (violet sleeve)	L.F. modulation to r.f. amplifier No 1 via pin K (PLD)	PLD-K	* 6	
7	Co-axial braid (black)	Chassis connection for braid of wire connected to 9	CHASSIS		
				8	Test point for terminal 7
9	Co-axial centre connection (grey sleeve)	L.F. modulation output to phase modulation circuit (module G)	CFTB3-2		
				10	Test point for terminal 9
11	Grey (red sleeve)	Local osc. inputs from emitter VT16 (buffer ampl. in local osc. circuit)	K1		
				12	Test point for terminal 11
13	Grey	Microphone input	A5	14	Test point for terminal 13
15	Co-axial centre connection	Receiver a.f. input	A11	16	Test point for terminal 15
17	Green (white sleeve)	+12V d.c. (on receive)	CFTB1-9		
				18	Test point for terminal 17

Table 4 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No. yellow	Service monitored
19	Brown	Receiver a.f. output	A1		
				20	Test point for terminal 19
* 21	Black	Chassis connections to front r.f.	N13	* 21	
22	Co-axial braid	Chassis connections	N13		
				23	Chassis connections test point: Tx wideband AMP
24	Co-axial centre connection	Wideband amplifier output	M27	25	
					Test point for terminal 24
26	Co-axial braid	Chassis connections for co-axial braid carrying wideband ampl output	M25	27	
					Chassis connections test point
28	Orange	L.F. modulation input and d.c. supply to VT24 collector	T11-2 (transformer)		
				29	Test point for terminal 28
30	Co-axial centre connection	Wideband amplifier input	M32		
				31	Test point for terminal 30
32	Black	Chassis connection	Chassis		
33	Red (brown sleeve)	+12V d.c. emitter supply to VT10 and 11 (a.m. only)	CFTB3-8		

Table 4 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No. Yellow	Service monitored
34	Blue	Connection to SYSTEM switch (SWB2R-11) to short-circuit T11 secondary and R84 on p.m. and c.w. - connecting 12V d.c. direct to L7 PA circuit	CFTB3-6		
35	Blue	To terminal 1-T11	T11-1	36	Test point for terminal 33
37	Red	+12V d.c. to T11 secondary (modulation h.t.)	T11-3		
38	White	VT10 collector	T11-6		
39	Green	VT11 collector	T11-4		

* Indicates combined terminal and test point

To remove Module D

26. a. Release the four socket-headed screws securing the module to the set.

b. Unsolder all leads connected to the terminals coded red and red/yellow and remove the module.

c. To replace, reverse the above procedure observing correct connections by reference to Table 5.

Table 5 - Module D terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
1	Violet	A.F.C. d.c. volts output	K11 via CFTB1-12	2	(Test point for T1) a.f.c. d.c. volts output

Table 5 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
3	Green	+12V d.c. to A.F.C. bias potentiometer chain	K8 via CFTB1-10		
				4	A.F.C. ±d.c. output metering (see TP7)
				5	(Test point for T3) +12V d.c.
6	Co-axial c.c./ brown sleeve	A.F. output	SWB/3R-3 via CFTB3-3		
				7	A.F.C. ±d.c. output metering (see TP4)
				8	(Test point for T6) a.f. output
9	Black	Discriminator circuit chassis connection	Earth tag near T11		
				10	VT9 collector a.c. volts metering
				11	(Test point for T12) i.f. input from T7 (IF3)
12	Co-axial c.c.	I.F. input from T7 (IF3)	J1		
13	Braid of 12	Limiter circuit chassis connection	J2		
				14	(Test point for T15) a.f.c amplifier and limited circuit chassis connection

Table 5 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
15	Not used			16	(Test point for T17) 500kHz input to a.f.c. amplifier VT8
17	Green	500kHz input to A.F.C. amplifier VT8	G26		
				18	(Test point for T19) +12V d.c. on Rec PM and transmit
19	Green/orange sleeve	+12V d.c. on Rec p.m. and transmit	SWB2F4 via CFTB3-12		
				20	(Test point for T21) +12V d.c. on transmit
21	Red/white sleeve	+12V d.c. on transmit	K10 via CFTB2-4		

To remove module F

27. a. Unsolder the leads to the terminals at each end of the module.

b. Release the four socket-headed screws securing the module to the set, remove the module.

c. To replace, reverse the above procedure observing correct connections by reference to Table 6.

Table 6 - Module F terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test point No Yellow	Service monitored
1	Black	Chassis connection	J18		
2	Blue	Filter output from T5	J19		

Table 6 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
3	2 co-axial braids associated with leads to 4 and 5	Chassis connections			
4	Co-axial c.c.	VT3 base bias and LO input	M22		
5	Co-axial c.c.	R.F. input to mixer VT3 base	M23		
6	Green/white sleeve	+12V d.c. on receive	J17		
				7	(Test point for T6) +12V d.c. on receive
				8	(Test point for T5) R.F. input to mixer VT3 base
				9	(Test point for T4) VT3 base bias
10	Black	Chassis connection	Earth pin adj to F10		

To remove Module G

28. a. Release the two socket headed screws securing the module to the set.

b. Unsolder all leads to the red terminals and remove the module.

c. To replace, reverse the above procedure observing correct connections by reference to Table 7.

Table 7 - Module G terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
1	Braid link	Chassis connection for VT25, VT26 (Transmitter mixer)	M30		
2	Co-axial c.c.	(T21 500kHz osc)	M28		
3	Co-axial c.c.	(output to Tx mixer)	M29		
				4) 5)	Test points for T2 and T3
6	Co-axial braid	Chassis connection for braid of co-axial lead to G7			
7	Co-axial c.c./ yellow sleeve	Local oscillator input for transmitter mixer	K18		
				8	Test point for T7
				9	Test point for T10
10	Red/white sleeve	+12V d.c. on transmit	K10 via CFTB2-7 and CFTB1-11		
11	Yellow	+12V d.c. on transmit p.m., a.m. and c.w. and on receive c.w. only	SWB/2R-9 via CFTB2-9 and CFTB3-10		
				12	Test point for T11
				13) 14)	Test points for carrying wire link - removed during the alignment procedure in production

Table 7 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
15	Blue	(1) A.F.C. d.c. volts on transmit p.m., a.m. and c.w. (2) B.F.O. d.c. volts on receive c.w. (3) Standing d.c. volts on receive p.m. and a.m.	K12 via CFTB2-10 and CFTB1-13		
				16	Test point for T15
				17	Test point for T18
18	Co-axial c.c./ red sleeve	Detector l.f. output	SWB/3R-5 via CFTB3-4		
				19	Test point for T20
20	Co-axial c.c./ green sleeve	l.f. input to phase modulator circuit	SWB/3R-12 via CFTB3-1		
21	2 co-axial braids	Chassis connection for braid of co-axial c.c. to G18 and G20			
				22) 23)	Test link removed to monitor detector current.
24	Pink	To chassis connection in module J i.f.	J5		
25	Pink	I.F. input to detector	J4		
26	(Green (Pink	500kHz a.f.c. output 500kHz b.f.o. output	D17 J3		

To remove module J

29. a. Release the three socket-headed screws securing the module.

b. Unsolder the leads from the red and red/yellow terminals and remove the module.

c. To replace, reverse the above procedure observing correct connections by reference to Table 8.

Table 8 - Module J terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
1	Co-axial c.c.	I.F. output to limiter/discriminator	D12		
2	Braid	Connection for braid of co-axial lead at Terminal 1	D13		
3	Pink	500kHz B.F.O. input	G26		
4	Pink	I.F. output to detector	G25		
5	Pink	Chassis continuation to detector	G24		
				6	Test point for T1
				7	Test point for T2
				8	Test point for T3
				9	Test point for T4
				10	VT6 emitter circuit
11	Green	+12V d.c. (receive) to r.f. amplifiers, RF1, RF2	M9	11	Test point for T11 (combined)
12	Orange	A.G.C. to r.f. amplifiers RF1, RF2	M10	12	Test point for T12 (combined)

Table 8 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
				13	VT5 emitter
				14	VT4 emitter
				15	Test point for T19
16	Green/white sleeve	+12V d.c. (for i.f. amplifiers and r.f. amplifiers RF1 and RF2)	K7 via CFTB1-9		
17	Green/white sleeve	+12V d.c. for receiver mixer	F6		
18	Black	Chassis connection	F1		
19	Blue	I.F. input from 500kHz filter	F2		
				20	Chassis connection for IF1, IF2 and a.g.c. detector/amplifier
				21	VT5 base via C37
				22	Chassis connection for IF3

To remove module K

30. a. Release the four socket-headed screws securing the module.

b. Unsolder all leads to red terminals and links between CFTB3 and the module. Remove the module.

c. To replace, reverse the above procedure observing correct connections by reference to Table 9.

Table 9 - Module K terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
1	Grey/red sleeve	R.F. alignment outputs from crystal and free tune oscillator providing beat note during tuning procedure	C11 Module		
2	Link	Connection of R138 to C.W. TONE control	A10 via CFTB1-6		
3	Link	+12V d.c. supply to VT16 (see TP24)	C2 via CFTB1-7 (Module)		
				4	Stabilised voltage of ZD4 for RV8 (C.W. TONE control)
				5	Chassis connection
6	Link	(-ve) Terminal B of coil of Relay RLA to pressel	A3 via CFTB1-8		
7	Link	(1) +12V d.c. to VT20 on rec (Mod C) (2) +12V d.c. to r.f. and i.f. amplifiers	J16 and C17 via CFTB1-9 (Module)		
8	Link	+12V d.c. for coil of relay RLA and distribution via RLA/1 to transmitter or receiver circuits	D3 and SWB/2R-7 via CFTB1-10 and CFTB3-9		
				9	Test point for terminal 8
10	Link	+12V d.c. on transmit	Module C4 SWB/2F-12, D21, G10, M5 via CFTB1-11 CFTB2-1, 2, 3, 4, 7, 8 and CFTB3-7		
11	Link	Discriminator a.f.c. d.c. output connection (to RLA/2-6)	D1 via CFTB1-12		

Table 9 - (cont)

Terminal No red	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
12	Link	ZD8 reactor via R111 connection to RLA/2-5	G15 via CFTB1-13 and CFTB2-6		
13	Link	C.W. TONE control-wiper (RV8-A) connection to RLA/2-4	A9 via CFTB1 14 and CFTB3-17		
14	Link	Connection to meter M1 of rectified produce of mixing of crystal and free tune oscillators while tuning on TUNE R.F. position of SYSTEM switch	SWB/IR-10 via CFTB1-15 and CFTB3-15		
15	Link	Connection to meter M1 of rectified antenna current of transmit p.m. and a.m. for t.r.f. tuning indication	SWB/IR-11 via CFTB1-16 and CFTB3-14		
16	Co-axial c.c/orange sleeve	To antenna socket SKTA	A7		
17	Co-axial c.c/yellow sleeve	R.F. input to VT1 base tuned circuit	M3		
18	Co-axial c.c/yellow sleeve	Common oscillator output to transmitter mixer from RLA/3-22	G7		
				19	Test point for terminal 18
20	Co-axial c.c/blue sleeve	Transmitter r.f. output from p.a. tank circuit to RLA/4-26 via C1	L6 module		
21	Yellow	Common oscillator output to receiver mixer from VT16 emitter	M4		
				22	Test point for terminal 21 common oscillator output

Table 9 - (cont)

Terminal No red	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
				23	Test point for terminal 14
				24	Test point for terminal 3
				25	Test point for terminal 27
				26	Test point for terminal 28
27	Co-axial c.c.	Input from common free tune oscillator to VT16 base	L11 module		
28	Red/yellow sleeve	+12V d.c. to crystal oscillator except on FREE TUNE (F) position of S.W.C.	A15 via CFTB1-5		
				29	Test point for terminal 30
30	Co-axial c.c.	Connection of VT28 base to BAND switch S.W.A. for selection of L or H group of crystals	L10 module		
31	Co-axial braid	Chassis connection (linked to terminal 32)	Braid of co-axial centre conn to terminal 30		
32	Black	Chassis connection	N11		

To remove module L

31. a. Remove the tuning scale.

b. Unsolder the two braid leads connecting terminals 13 and 15 to the chassis of module N.

c. Unsolder the red wire with white sleeve from N3.

d. Unsolder the twelve wires to the module terminal board.

e. With the BAND switch set to L, slacken the socket-headed screw on switch coupling between module and front panel.

f. Withdraw the switch shaft to the rear sufficiently to clear the module.

g. Release the two socket-headed screws securing the module.

h. Remove the module, tilting it towards the space immediately below the tuning drive shaft to facilitate removal.

j. To replace, reverse the above procedure observing correct connections by reference to Table 10.

k. After replacement of module it is necessary to check the alignment of the BAND switch (paras 35-37).

Table 10 - Module L terminal connections

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
1	Orange	d.c. supply to VT17 and VT18	A16	1	d.c. supply to VT17 and VT18
2	Red	Connection to C88 (GB3)	N7		
3	Yellow/violet sleeve	Connects SWA/1-10 to C148 (front panel) on SWC/2-9	A13		
4	Red	Connection from C64 (GA3)	N3		
5	Black	Chassis connections for antenna windings of transformer T10 and T9 at A6 (SKTA)	Braid of L6 module	5	Chassis connections for antenna windings of T10 and T9
6	Co-axial c.c./ blue sleeve	PA tank circuit output	K20	6	P.A. tank circuit
7	Blue	+12V d.c. supply to p.a. (direct on p.m. and c.w. via modulator on a.m.	SWB/2R-11 via CFTB3-6	7	+12V d.c. to p.a. (direct on p.m. and c.w. via modulator on a.m.

Table 10 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No (yellow)	Service monitored
8	Co-axial c.c.	Connection between SWA/2-8 and collectors of VT29 and VT30	B3	8	R.F. output at collectors of VT29, VT30
9	Yellow	Connects SWA/1-12 to C149 (front panel)	A14		
10	Co-axial c.c.	Connects SWA/1-11 to base of VT28 (crystal oscillator module K)	K30		
11	Co-axial c.c.	Connects free tune oscillator output to base of buffer amp VT16 (module K)	K27	11)	Free tune oscillator output to base of buffer amplifier VT16 (module K)
12	Co-axial braid	Braid continuation for co-axial lead to terminal 11		12)	
13	Braid	Chassis connection	N9		
				14	Stabilised d.c. supply to VT17, VT18
15	Braid	Chassis connection	N10		

To remove module M

32. a. Remove the tuning scale.

b. Unsolder all leads from red and red/yellow terminals separately, withdrawing the co-axial wires from M22, M23 and braid from M21 through the grommet to clear top of RF2 section.

c. With BAND switch set to L slacken the socket-headed screw on switch coupling between module L and front panel.

d. Withdraw switch shaft to rear sufficiently to clear the module.

e. Release the four captive pillar screws adjacent to modules D and G and remove module.

f. To replace, reverse the above procedure observing correct connections by reference to Table 11.

g. After replacement of module it is necessary to check the alignment of the BAND switch (para 35-37)

Table 11 - Module M terminal connections

Terminal No red	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
1	Yellow	Alternative level of drive output to bases of VT29, VT30, by-passing R137 by fitting a link across M1 and M6.			
2	Black	Earthing braid of co-axial lead to M3	Braid of co-axial c.c. to M3		
3	Co-axial c.c./ yellow sleeve	R.F. receiver signal input from aerial (via RLA/4) see TP14	K17		
4	Yellow	Input from common local oscillator to base of mixer VT3 via SW.A/5 and T22	K21		
5	Red/white sleeve	d.c. supply to VT25 and VT26 (Tx mixer)	K10 via CFTB2-8 and CFTB1-11	5	d.c. supply to VT25 and VT26 (mixer stage)
6	Co-axial c.c.	Driver output to bases of PA transistors VT29, VT30	B1		
7	Blue	Wires from Ledex switch in r.f. amplifier No 1 to SW.A/3 the BAND switch in the set.	PLD-A	7	Earthed when L selected (low band)
8	Red/yellow sleeve	When H is selected red wire/yellow sleeve (connected to SW.A/3-12), is earthed operating Ledex to H band position	PLD-C	8	Earthed when H selected (high band)

Table 11 - (cont)

Terminal No red	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
9	Green	+12V d.c. to VT1 and VT2 (see TP19)	J11		
10	Orange	A.G.C. to bases of VT1 and VT2 (see TP20)	J12		
				11	Driver output to bases of p.a. transistors VT29, VT30 (test-point for M6)
12	Red	Continuation of co-axial c.c. to GA2 (Tx mixer)	N2		
13	Black	Continuation of braid of co-axial to GA2	N4		
				14	Receiver r.f. signal input from aerial via RLA/4 (test-point for M3)
15	Black	Continuation of braid of co-axial to GB2	N6		
16	Red	Continuation of co-axial c.c. to CB2 (RF2)	N8		
17	Black	Chassis connection for RF1	N14		
18	Red	Connection to C7 and C8 (GA1)	N1		
				19	+12V d.c. (test-point for M9)
				20	A.G.C. volts (test-point for M10)
21	1 braid and 1 black	Chassis connection for RF2	Chassis N14	21	Chassis connection for RF2
22	Co-axial c.c.	Bias (from junction R8/R9) to base of VT3 mixer via T22 (RF2)	F4	22	VT3 (mixer) base bias to mixer via T22 (RF2)

Table 11 - (cont)

Terminal No (red)	Wire identification	Service carried	Destination	Test point No yellow	Service monitored
23	Co-axial c.c.	Input to Rx mixer base from T22 (RF2)	F5	23	Input to mixer from transformer 22 (RF2)
24	Red	Connection to C107/C108 (GB1)	N5		
25	2 black	(1) Earthing braid of co-axial lead to M27 (2) Driver chassis connection	Braid of c.c. to M27 N13		
26	Orange/yellow sleeve	d.c. supply to VT23 (via modulator)	T11-2	26	d.c. supply to VT23
27	Co-axial c.c.	Driver input from T18 wide band amplifier (module C)	C24 module	27	Driver input from T18 wide band amplifier (module C)
28	Co-axial c.c.	Input to transmitter mixer from transformer	G2	28)	Input to transmitter mixer
29	Co-axial c.c.	T21 (module G)	G3	29)	
30	Black	Links braids of co-axial leads to M28 and M29 to earth on module G via braiding in BK sleeve	G1		
31	Black	Transmitter mixer chassis connection for r.f. assembly	N13	31	Transmitter mixer chassis connection for r.f. assembly
32	Co-axial c.c.	Transmitter mixer output to wide band amplifier (module C)	C30 module	32	Transmitter mixer output to wide band amplifier (module C)
				33	Test point for M30 mixer component board earth

To remove module N

33. a. Remove the tuning scale.

b. Remove modules L, M, C, F and J.

c. Carry out operations b, d, e, and f for removal of complete front panel (module A).

d. Release the eight screws securing the module to the mounting frame and remove the module.

e. To replace, reverse the above procedure.

Table 12 - Module N terminal connections

Terminal No (red)	Wire identification	Service carried	Destination
1	Red	Connection to GA1 (C8 and C7) RF1	M18
2	Red	Connection to GA2 (C116) transmitter mixer	M12
3	(Red ((Red/white sleeve	Connection between GA3 (C64) p.a. tank circuit and SWA/2-11 C65 r.f. trim on front panel (module A)	L4 module A8 (C65)
4	Black	Braid of co-axial lead from GA2	M13
5	Red	Connection to GB1 (C108, C107) transmitter driver	M24
6	Black	Braid of co-axial lead from GB2	M15
7	Red	Connection to GB3 (C88) free-tune oscillator	L2 module
8	Red	Connections to GB2 (C15, C14) RF2	M16
9	Braid	Chassis connection	L13 module
10	Braid	Chassis connection	L15 module
11	Black	Chassis connection	K32
12	Black	Chassis connection	A17

Table 12 - (cont)

Terminal No red	Wire identification	Service carried	Destination
13	(Braid	Chassis connections	C22 module
	(3 Black	Chassis connections	C21 modules M25, M31
14	2 Black	Chassis connections	M17, M21

Alignment of tuning scale

34. a. Remove the socket-headed screw and washer adjacent to the worm on the drive shaft.

b. Rotate the TUNE control fully clockwise until the heart-shaped washer comes into contact with the capacitor assembly capacitor assembly case.

c. Slacken the three screws securing the tuning scale sufficiently to allow the scale to be rotated, so that the scale alignment marker (located about half an inch from the low frequency end of the scale) coincides with the cursor line. Tighten the tuning scale securing screws.

d. Rotate the TUNE control anti-clockwise raising the heart-shaped washer so that the securing screw may be replaced. Replace and tighten securing screw.

e. The scale alignment marker will no longer coincide with the cursor line. This is intended and prevents strain on the vanes of the tuning capacitors. When fully clockwise the alignment marker will now approximately coincide with the first dot below the cursor line.

Alignment of BAND switch

35. This is necessary to ensure that the wafers of the BAND switch in modules L and M make and break at the same time.

36. Alignment must be carried out with the BAND switch set to L.

37. a. Slacken the socket-headed screw on switch coupling between module L and the front panel.

b. Place the calibrated scale on rear end of the set, sighting the hole over the switch shaft and the edge level with the end of the overhang above the tuning scale. Details of the calibrated scale are given in Fig 10.

c. Pull the switch shaft upwards to disengage the coupling and fit the pointer on to the slotted end of the shaft. Details of the pointer are given in Fig 11.

d. Lower the shaft and pointer to the calibrated scale. The shaft will have a certain amount of free movement, that is, the pointer can be moved slightly to the right or left without disengaging the click mechanism.

Find the centre position of this free movement and line up the DATUM LINE on the scale with the pointer. Secure the scale in this position with adhesive tape.

e. Unsolder the connections to pins 7 and 8 on module L and pin 7 on module M.

f. Connect the multimeter set to the Ω x 1 range between pin 7 and earth on module M.

g. Move the pointer to the left and right, marking the points on each side of the datum line on the scale where the make and break occur. These points should be equally spaced each side of the datum line.

h. Connect the multimeter between pins 7 and 8 of module L.

j. Proceed as in g., the make-and-break points should be approximately at the same points as for module M.

k. Slacken the two socket headed screws securing module L and rotate the module so that the make and break points as nearly as possible coincide with the points on module M.

l. Tighten the module securing screws and re-check the alignment.

m. Remove the pointer from the switch shaft and lower the shaft to engage in the coupling. Tighten the coupling.

n. Remove the calibrated scale and re-solder the connections to pins 7 and 8 on both modules.

Amplifier r.f., removal of components

38. The amplifier (Fig 2504, 2505) is of very compact construction containing four sections as follows:-

a. R.F. section (end section) containing essentially r.f. components.

b. Centre section containing some r.f. components and some modulator components.

c. Modulator section containing the main modulator components.

d. Front panel carrying the controls.

39. To change any component with a minimum of dismantling Table 13 should be read first to identify the relevant paragraph. The detailed instruction may then be followed to remove a component. Details are not given for refitting components since normally it is only necessary to reverse the removal order.

Table 13 - Amplifier r.f. component removal sequence

Components	Section located in	See paragraph
VT1	RF Section	40
L5		41
R7		42
L6		43
Ledex assembly		44
L2		45
C10/C11 (tune output)		46
L1		47
T1		48
Relay RLB and tagboard assembly	Centre Section	49
T2		50
L4		51
L3		52
C2 (tune input)		53
Component board	Modulator	54
Relay RLA		55 and 56
T3		57
VT2 and VT3		58-60
VT4 and VT5		61-63
Meter	Front panel	para 64
Meter component board		
Relay RLC		
SW.B (System selector)		
R.F. INPUT socket		
R.F. OUTPUT socket		
SKT.B 6-way sockets		
SKT.C		

40. a. Remove the six socket-headed 6BA screws and the two 4BA socket-headed screws securing the base plate to the amplifier.

b. Unsolder the pink wire from the lug on L5 and the blue and yellow wires from the feed-through pins adjacent to PLA.

c. Remove base plate, heat sink and transistor assembly.

41. a. Remove the two 6BA cheese-headed screws securing the inductor to the chassis.

b. Unsolder all connections to L5 and remove.

42. a. Unsolder the co-axial centre connector from the resistor.

b. Release the screw securing the resistor and remove.

43. a. Carry out operations detailed in para 40.

b. Unsolder the following connections:-

(1) Red wire to C11

(2) Blue wire to SWA/2-1

(3) Green wire to SWA/2-3

c. Release the screw securing L6 to its centre post and remove.

44. a. Carry out operations detailed in para 40.

b. Remove the two 6BA socket-headed screws securing the ledex assembly to the r.f. chassis.

c. Remove the three 4BA socket-headed screws securing the ledex assembly to the modulator chassis.

d. Unsolder the following connections from the feed through pins adjacent to the input tuning capacitors:-

(1) Red wire with white sleeve.

(2) Violet wire.

(3) Pink wire.

e. Unsolder the green wire to C2 at the stand off insulator on the screen of the ledex switch.

f. Unsolder the following connections to T1:-

(1) Brown sleeved concentric connector to pin 1.

(2) Braid to pin 3.

(3) Concentric connector to pin 2.

g. Unsolder the following connections from SWA:-

(1) Black wire to SW.A/3-3

(2) Blue wire to SW.A/2-1

(3) Co-axial connector with white sleeve to SW.A/2-2 and braid to adjacent earth terminal.

(4) Green wire to SW.A/2-3

h. Remove complete ledex assembly.

j. To remove ledex switch unsolder remaining wires to SW.A and release the three screws securing ledex switch to the chassis. Ease the switch away from the chassis to obtain access to C23 and then unsolder C23 from ledex contacts and the black (chassis) wire from the screen. Remove ledex switch.

45. a. Carry out operations detailed in para 44 a.-g.

b. Unsolder the blue wire from L2 to SWA/3-6.

c. Remove L2 by completely retracting the centre post screw. This can be done without unsoldering wires from L1.

46. a. Carry out operations detailed in para 40.

b. Release the two screws on the TUNE OUTPUT shaft coupling on the capacitor side of the coupling.

c. Remove the three 4BA socket-headed screws securing the three tie pillars bolting the r.f. chassis and modulator chassis plates. Remove the socket-headed screw securing the bonding strip between r.f. chassis and modulator chassis.

d. Remove the two dome-headed screws on C2 and remove the bonding strip between r.f. chassis and C2.

e. Remove the two 6BA socket-headed screws securing the bracket of the ledex assembly to the r.f. chassis.

f. Remove the two 6BA socket-headed screws securing PLA and withdraw it away from the chassis.

g. Remove the 6BA socket-headed screw securing the mounting board for RLB to the centre section.

h. Carefully ease the r.f. chassis away until the three cheese-headed screws securing C10/C11 are accessible. Unsolder C8 with R4 and the red wire to L6. Remove the TUNE OUTPUT assembly.

47. a. Unsolder the black wire to SW.A/3-1 and the blue wire to SW.A/3-4.

b. Remove the 2BA nut and washer securing L1 to the centre post screw and remove L1.

48. a. Carry out operations detailed in para 44 a. to g.

b. Unsolder the red wire from pin 4 of T1.

c. Remove the 6BA nut and bolt securing T1 to ledex assembly and remove T1.

49. a. Carry out operations detailed in para 46 a.-g.

b. Remove the two 6BA cheese-headed screws securing the relay board to the modulator chassis. Ease the r.f. unit away from the modulator chassis to allow easier access to the relay board.

c. Unsolder the following wires:-

(1) Green (RLA-5)

(2) Blue/white sleeve (RLA-3)

(3) Orange (RLA-2)

(4) Brown (RLA-22)

(5) Yellow (RLA-24)

(6) Black

(7) Green/white sleeve

(8) Red/yellow sleeve

(9) Red/white sleeve

d. Move the relay terminal board away from the adjacent pillar to allow easier access to the top of the relay board and unsolder the following wires:-

(1) Green/white sleeve

(2) Pink

(3) Violet

(4) Red/white sleeve

(5) Red

(6) Blue

(7) Blue/white sleeve

e. Unsolder the blue wire from test point 2 and the co-axial cable (from the front panel) at the terminal board.

f. Remove the terminal board and PLA, wires to PLA can be unsoldered after the terminal board has been removed.

50. a. Remove the three 4BA socket-headed screws securing the ledex assembly to the modulator chassis.

b. Carry out operations detailed in para 46 a.to g.

c. Unsolder the wires from the 7-way tag board on T2.

d. Unscrew the four 2BA cheese-headed screws securing T2 and remove.

51. a. Unsolder the green wire from the outer terminal and the yellow and black wires from the terminal board on the inductor.

b. Unscrew the two hexagon-headed screws securing L4 and remove.

52. a. Unsolder the green wire with a white sleeve and R1 from terminal 1 and the green wire from terminal 2.

b. Unscrew the cheese-headed screw securing L3 and remove.

53. a. Remove the three 4BA socket-headed screws securing the ledex assembly to the modulator chassis.

b. Carry out operations detailed in para 46 a to g.

c. Partially detach the modulator chassis from the front panel by unscrewing and removing the four 2BA socket-headed screws at the corners. Remove the 8BA socket-headed screws securing the earthing strip between the front panel and modulator chassis.

d. Partially separate the modulator chassis from the r.f. chassis to allow removal of C2.

e. Withdraw the wiring from the rubber grommets in the modulator chassis and swing the front panel to one side to completely expose the underside of the modulator chassis.

f. Release and remove the drive gear from C2 drive shaft. Remove the three cheese-headed screws securing C2 to the chassis.

g. Unsolder the green wire from C2, and remove C2.

h. Note on refitting: Since C2 driven gear is of the anti-backlash type, it is necessary to align the teeth of the two sections of the driven gear to remesh it with the spur drive gear (TUNE INPUT).

54. a. To obtain general access to the modulator assembly carry out operations detailed in para 53 c. and e.

b. Unsolder the orange and yellow wires from VT6 at the underside of the tag board.

c. Unsolder the other external wires to the board as follows:-

(1) Co-axial centre connector to RV1.

(2) Braid and black wire from R15.

(3) Red wire from junction of C15/R12.

(4) White wire from junction of R10/TH1/R11 to T3.

d. Unscrew the four cheese-headed screws securing the board and remove.

55. a. It is possible to change a coil assembly without unsoldering the leads to the contact-set terminals; these may be retained for service with a new coil.

b. Carry out operations detailed in para 54. a.

c. Remove the two countersunk screws securing the end of the coil assembly to the triangular bracket and ease the relay away from the chassis.

d. Unscrew the 8BA cheese-headed screw securing the contact assembly to the coil just sufficiently to release it from the screw thread in the coil assembly. Remove the contact assembly complete without withdrawing the screw entirely.

e. The coil assembly may now be removed by unsoldering the two wires from the coil terminals.

56. a. Carry out operations detailed in para 55 b to d.

b. Fit a new contact set (or sets) as required unsoldering one wire at a time and transferring it to the new set.

57. a. Carry out operations detailed in para 54 to provide access to T3.

b. Remove the two cheese-headed screws securing T3 to the modulator chassis.

c. Unsolder the following wires from T3 terminal board:-

(1) Violet wire from the green terminal.

(2) Black wire from the red terminal.

(3) Yellow wire from the yellow terminal.

(4) White wire from the white terminal.

(5) Yellow wire from the blue terminal.

58. a. Carry out operations detailed in para 54.

VT2

59. a. Unsolder the following wires:-

(1) Orange wire and one end of R8 from the base.

(2) Orange wire and the other end of R8 from the emitter.

(3) Violet wire from the collector

b. Unscrew the 2BA nut securing the transistor to its heat sink and withdraw VT2.

VT3

60. a. Unsolder the following wires:-

(1) Orange wire and one end of R9 from the emitter.

(2) Orange wire and the other end of R9 from the base.

(3) Violet wire from the collector.

b. Unscrew the 2BA nut securing the transistor to its heat sink and withdraw VT3.

61. Carry out operations detailed in para 54.

VT4

62. a. Unsolder the following wires:-

(1) Orange wire from the base of VT2.

(2) Violet wire from the collector of VT2.

(3) Yellow wire from the yellow terminal on T3 lift the transistor out of its recess in the heat sink.

VT5

63. a. Unsolder the following wires:-

(1) Orange wire from the base of VT3.

(2) Violet wire from the collector of VT3.

(3) Yellow wire from the blue terminal of T3. Lift the transistor out of its recess in the heat sink.

64. a. Partially detach the modulator chassis from the front panel by removing the four 2BA socket-headed screws at the corners. Remove the 8BA socket-headed screw securing the earthing strip between the front panel and modulator chassis.

b. Release the TUNE OUTPUT drive control from the capacitor drive shaft at the capacitor shaft side.

c. Withdraw the wiring from the grommets in the modulator chassis and swing the front panel assemble to one side.

d. All front panel controls are now easily accessible and removal is a straightforward procedure. The special meter spanner (Fig 12) will facilitate the removal of the meter.

e. When components bolted through the front panel are changed, particular care should be taken to ensure that the seals are correctly fitted and remade.

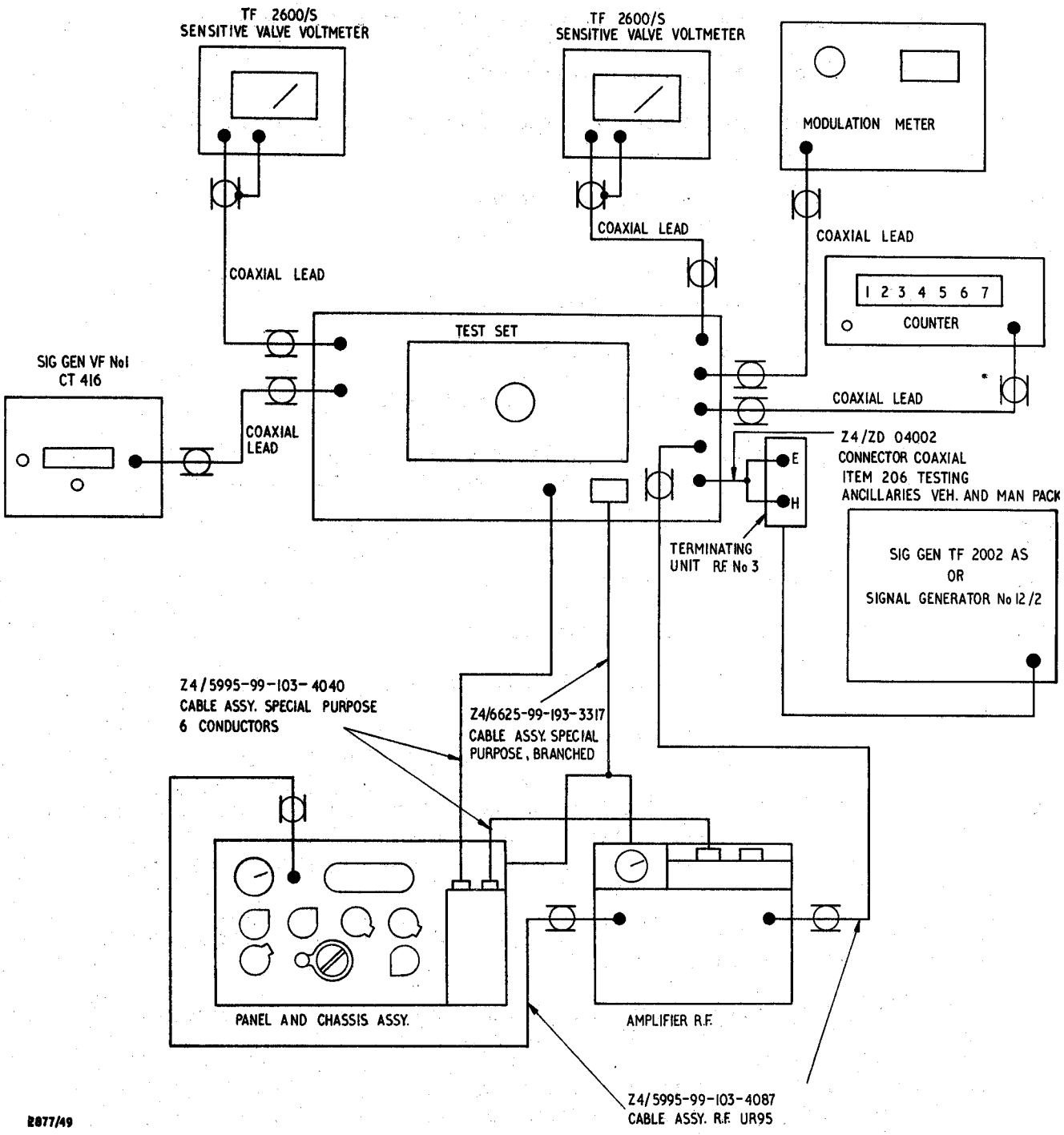

Fig 3 - TRA14, test-gear arrangement

SPECIFICATION TESTS

General

65. The tests shown in this regulation are those which are necessary to prove the serviceability of an equipment. They should be carried out each time an equipment is inspected and/or repaired.

Table 14 - Test equipment

Cat No (Section Z4)	Designation	Required for use with				
		TRA 14	TRF	HG	RCU	12/24V BC
6625-99-105-7652	Wattmeter, absorption h.f. No 2 CT211		X			
6625-99-105-7106 or 6625-99-103-5993	Meter set, modulation CT542 Test set, modulation (Aimec 210)	X				
6625-99-105-7049 or 6625-99-949-1999	Multimeter set, CT498A Multimeter set, CT498	X	X	X	X	X
6625-99-108-9800 or 6625-99-102-8677	Signal generator set, CT572/2 Marconi TF2002AS Signal generator, No 12/2 CT320A	X				
ZD04247	Signal generator, video-frequency No 1 equipment CT416	X			X	
6625-99-933-1822	Counter, frequency meter	X				
6625-99-108-9657 or 6625-99-949-0470	Multimeter set, electronic, CT569 Voltmeter, valve, No 3 CT208 Eqpt	X				
6625-99-102-6694	Oscilloscope set, CT436, with probe	X		X		X
6625-99-106-1341	Voltmeter set, electronic	X	X		X	
6625-99-949-0510	Wattmeter, absorption, a.f., No 1 CT44				X	
6625-99-106-0702	Test Kit, radio, S.R.A.14	X	X		X	
6625-99-106-3438	Power supply set, Solartron, AS1412/M			X		
6625-99-106-2685 or Z4/WD3611	Panel test electrical Meter circuit magnification No 1		X			
6625-99-104-6557	Test kit, radio, vehicle and manpack, radio sets		X			

Table 14 - (cont)

Cat No (Section Z)	Designation	Required for use with				
		TRA 14	TRF	HG	RCU	12/24V BC
5905-99-011-3353	Resistor, fixed, w.w. 15Ω (Qty 2)			X		X
5905-99-011-3367	Resistor, fixed, w.w. 56Ω (Qty 1)			X		

Table 15 - Summary of specification tests

Test	Category	Set sealed/unsealed
R.F. power output and freq	A	sealed
Mod sensitivity and a.m.c.	A	sealed
Sidetone a.m. p.m. c.w.	A	sealed
Transmitter a.f. response	A	sealed
A.F.C. operation	A	unsealed
Signal-to-noise ratio p.m.	A	sealed
Signal-to-noise ratio a.m.	A	sealed
Signal-to-noise ratio c.w.	A	sealed
Receiver selectivity	A	unsealed
Second channel rejection	B	unsealed
I.F. rejection	B	unsealed
A.F. output p.m.	A	sealed
A.F. output a.m.	A	sealed
A.F. output c.w.	A	sealed
Receiver a.f. response	A	sealed
A.G.C. operation	A	sealed
Limiting residual noise	A	sealed
Receiver residual noise	A	sealed
Netting error	A	sealed

Table 15 - (cont)

Test	Category	Set sealed/unsealed
Power consumption	A	sealed
Tuning-scale calibration	A	unsealed

66. The specification and methods of carrying out the tests are listed in para 87-108. These are also summarized in Table 15. Those tests which can be carried out whilst the set is sealed are sufficient to prove the serviceability of the equipment.

67. All testing and alignment instructions are based on the use of the Test kit, radio TRA14 together with the peripheral test equipment shown in Fig 3 and listed in Table 14. To test the T.R.A.14 in its case, the Adaptor battery, test set, S.R.A.14 should be used. To ensure correct connections, when the adaptor is fitted in the battery compartment, the red-coded lug on the adaptor should be adjacent to the 7A fuse positions.

Test conditions

68. The crystals supplied with the test kit are to be inserted as follows:-

Channel	Crystal frequency
L1	2700kHz
L2	4300kHz
H1	4900kHz
H2	8100kHz

69. Tests are to be carried out with the supply voltage set to 12.6V d.c. unless otherwise stated.

70. All tests are carried out with the set tuned up in the normal manner. This is described in para 80-86.

71. For receiver measurements the signal generator voltages quoted in this regulation are the open circuit voltages before connection to the receiver.

72. The transmitter antenna load shall be 75Ω, this is included in the test set.

73. The microphone input shall be obtained from a 300Ω source. Voltages and impedances are of correct value where the Test Set is calibrated as detailed in para 88. b. (1) - (3).

74. When measurements of modulation are made the phase deviation measurements are to be made on both FM PEAK + and FM PEAK - and the mean of these will be regarded as the test result. Similarly, a.m. measurements are made on AM PEAK and AM TROUGH, the mean being the test result.

75. The receiver and sidetone a.f. outputs are measured with a 150Ω load which is provided by the test set.

76. Handsets must not be connected to the set during tests.

77. The T.R.A.14 GAIN control shall be at maximum ie fully clockwise unless otherwise stated. The C.W. TONE control is set at zero, ie the pointer on the control shall be in line with the white spot on the front panel.

78. Unless otherwise stated, the signal generator is to be tuned to the set. The method of doing this depends upon whether the set is sealed or open. If the set is sealed, the signal generator should be tuned for maximum a.f. output. If the set is open, the generator should be tuned for maximum detector current.

79. The test switch on the test set is a 12-position switch and for convenience switch positions are to be referred to using the clock system, eg 12 o'clock etc.

Tuning procedure for T.R.A.14

80. Set system switch on the panel and chassis assembly to TRF. Set CHANNEL switch to required channel and BAND switch to required band.

81. Release tuning lock and rotate tuning control until required frequency is in the centre of the window. Adjust tuning control accurately for a maximum on the front panel meter or zero beat in the loudspeaker in the test set. Lock the tuning mechanism.

82. Set system switch on the panel and chassis assembly to PM. Set system switch on the amplifier r.f. to TUNE IN. Switch to send by setting the test switch on the test set to 12 o'clock.

83. Adjust TUNE INPUT control on amplifier and R.F. TRIM control on the panel and chassis assembly for a maximum on the amplifier front panel meter.

84. Set system switch on the amplifier to TUNE OUT. Adjust TUNE OUTPUT control on amplifier for a maximum on the amplifier front panel meter.

85. Set system switch on amplifier to OPERATE LP or HP. Set system switch on the panel and chassis assembly to required type of transmission, the set is then ready to operate.

86. To tune when operating without using crystal-controlled channels, set CHANNEL switch to F and BAND switch to required band. Rotate tuning control until required frequency is in the centre of the window. Carry out para 82-85.

Transmitter tests

R.F. power output and frequency

87. With the test switch on the test set at 12 o'clock measure the r.f. power of the set at the frequencies, and system switch positions shown in the Table 16. The r.f. valve-voltmeter readings shall exceed the figures shown in the table. The frequency indicated on the counter shall not vary from the nominal frequency by more than the limits given in the table.

Table 16 - Transmitter output voltages

SYSTEM	LOW BAND freq			HIGH BAND freq		
	L1* 2.2 MHz	Free-tune position 2.7 MHz	L2* 3.8 MHz	H1* 4.4 MHz	Free-tune position 6.1 MHz	H2* 7.6 MHz
LP AM	9.5V	9.5V	9.5V	9.5V	9.5V	9.5V
LP PM/CW	11.6V	11.6V	11.6V	10.6V	10.6V	10.6V
HP AM	23.7V	21.2V	19.3V	21.2V	19.3V	18.3V
HP PM/CW	35.6V	34.6V	32.4V	33.5V	32.4V	31.2V
Freq error	±1kHz		±1kHz	±1kHz		±1.2kHz

Modulation sensitivity and a.m.c.

88. a. Specification: With a modulation input of 1000Hz, the deviation on P.M. and the mddulation depth on A.M. shall vary with input level as follows:-

		A.M. mod depth	
A.F. INPUT	P.M. deviation Hz	L.P.	H.P.
10mV	greater than 800	greater than 40°/o	greater than 70°/o
100mV	less than 1500	less than 100°/o	less than 100°/o

b. Method: (1) Set SIG GEN V.F. No 1 to 1000Hz at 10V

(2) Set test switch on test set to 1 o'clock, depress MOD LEVEL CHECK switch and adjust CAL control for a reading of 10mV on a.f. valve-voltmeter.

(3) Set test switch to 2 o'clock and check mod level is 100mV. Return switch to 1 o'clock.

(4) Tune set to 2.2MHz (L1) and switch to PM LP. Tune in deviation meter.

(5) The deviation meter shall indicate a deviation greater than 800Hz.

(6) Set test switch to 2 o'clock the deviation meter shall read less than 1500Hz. Return switch to 1 o'clock.

(7) Switch set to AM LP and set up modulation meter to read a.m. percentage modulation.

(8) With test switch at 1 o'clock the modulation meter shall read within the limits 40 and 100°/o.

(9) Switch set to AM HP the modulation meter shall read within the limits 70 and 100°/o.

(10) With test switch at 2 o'clock the modulation meter shall read less than 100°/o on LP and HP.

(11) Repeat (4) to (10) at 7.6MHz (H2).

Sidetone, (p.m. a.m. and c.w.)

89. a. Specification: With the transmitter modulated with a 1000Hz tone at a level of 10mV the sidetone output on P.M., A.M. and C.W. shall be greater than 55mV.

b. Method: (1) Tune set to 7.6MHz (H2) and switch to P.M. L.P.

(2) Set test switch to 1 o'clock the reading on the a.f. valve-voltmeter shall be greater than 55mV.

(3) Switch to AM LP the reading on the valve-voltmeter shall exceed 55mV.

(4) Switch to CW LP and set test switch to 12 o'clock the reading on the valve-voltmeter shall exceed 55mV.

(5) Switch on test-box loudspeaker the sidetone frequency should be approximately 500Hz - 6kHz (aural check only).

Transmitter a.f. response

90. a. Specification: With a modulation input at a level to give 30°/o modulation on AM the input level variation with frequency shall not exceed:

Frequency kHz		0.5	1.0	2.5	10
Input dB	AM	±3	0	±3	+10 min

b. Method: (1) Tune set to 7.6MHz (H2) switch to AM LP and tune in the modulation meter.

(2) Set test switch to 1 o'clock and adjust Sig gen v.f. No 1 to give 30°/o modulation at 1kHz.

(3) Depress MOD LEVEL CHECK switch and note reading on a.f. valve voltmeter.

(4) Adjust Sig gen v.f. No 1 to give 30°/o modulation at 500Hz.

(5) Depress MOD LEVEL CHECK switch and note reading on a.f. valve-voltmeter this must be within 3dB of the reading obtained in (3).

(6) Repeat (4) and (5) with modulation frequencies of 2.5 and 10kHz.

A.F.C. operation

91. a. Link the test points 21 and 20 on module J and connect frequency counter to VT6 collector, test point J9. Set channel switch to T, system switch to CW and test switch to 5 o'clock. Adjust CW TONE control for 500kHz as read on the counter. Connect a 1000pF capacitor between test point J8 and chassis and note the frequency difference (approx 5kHz).

b. Switch to channel H2 and set test switch to 12 o'clock. Note the counter frequency (F1). Remove the 1000pF capacitor and note the difference in frequency from F1. This shall be less than 10°/o of the difference in 91. a. Remove link from J21 and J20.

Receiver Tests

Signal-to-noise ratio (p.m.)

92. a. Specification: With an input of 4μV the ratio of the receiver a.f. output with modulation (400Hz deviation at 1000Hz) to the output with no modulation shall not be less than 14dB.

b. Method: (1) Tune the set to 2.2MHz (L1) and set system switch to PM.

(2) Set test switch to 3 o'clock.

(3) Set signal generator to 2.2MHz with 400Hz deviation at 1000Hz and output level of 4μV.

(4) Tune the signal generator to the set (para 78).

(5) Note the a.f. valve voltmeter reading.

(6) Switch the signal generator modulation off, do this by setting the DEVIATION KHZ - RANGE switch to OFF, not by switching the MODULATION SELECTOR from FM to CW. Set test switch to 4 o'clock.

(7) The a.f. valve-voltmeter reading must be less than reading (5).

(8) Repeat (1) to (7) at 3.8, 4.4 and 7.6MHz.

Signal-to-noise ratio (a.m.)

93. a. Specification: With an input of 6.3μV the ratio of the receiver a.f. output with modulation (30°/o at 1000Hz) to the output with no modulation shall not be less than 14dB.

b. Method: (1) Tune the set to 2.2MHz (L1) and set system switch to AM.

(2) Set test switch to 3 o'clock.

(3) Set signal generator to 2.2MHz with 30°/o modulation at 1000Hz and output level of 6.3μV.

(4) Tune the signal generator to the set.

(5) Note the a.f. valve-voltmeter reading.

(6) Switch the modulation off and set test switch to 4 o'clock.

(7) The a.f. valve-voltmeter reading must be less than reading (5).

(8) Repeat (1) to (7) to 3.8, 4.4 and 7.6MHz.

Signal-to-noise ratio (c.w.)

94. a. Specification: With an input of 2μV, the ratio of receiver output with the CW TONE control adjusted for maximum to the output with the CW TONE control adjusted for a minimum shall not be less than 15dB.

b. Method: (1) Carry out procedure detailed in para 93. b. (1) to (4).

(2) Switch signal generator and set from AM to CW.

(3) Set test switch to 5 o'clock.

(4) Reduce signal generator output level to 2μV.

(5) Adjust CW TONE control to produce a maximum reading on the a.f. valve-voltmeter and note this reading.

(6) Set test switch to 6 o'clock and adjust the CW TONE control to produce a minimum reading on the a.f. valve voltmeter. The reading must be less than reading (5).

(7) Repeat (1) to (6) at 3.8, 4.4 and 7.6MHz.

Selectivity

95. a. Specification: The bandwidth should be as follows:-

6dB bandwidth not less than 6kHz.

65dB bandwidth not greater than 20Hz.

b. Method: (1) Tune the set to 2.2MHz (L1), set system switch to AM and test switch to 7 o'clock.

(2) Remove the link between terminals 22 and 23 on module G and connect the multimeter, set to 50μA d.c., in place of the link (+ve to terminal 22).

(3) Set the signal generator to a counted 2.2MHz, unmodulated, the signal generator output adjusted to give 10μA detector current.

(4) Increase the signal generator output by 6dB. De-tune the signal generator either side of 2.2MHz and note the two frequencies at which the detector current is again 10μA.

(5) The bandwidth shall be greater than 6kHz and the arithmetic mean of the two frequencies shall be within ±500Hz of 2.2MHz.

(6) Repeat (4) with the signal generator output increased by 65dB; the bandwidth shall not be greater than 20kHz.

Second-channel rejection (B)

96. a. Specification: The receiver output with an input at the second channel frequency shall be not less than 30dB down on the output at the signal frequency.

b. Method: (1) Tune the set to 7.6MHz (H2), set system switch to AM and test switch to 7 o'clock.

(2) Connect multimeter as in para 95. b. (2).

(3) Set signal generator to 7.6MHz unmodulated and output level of 3.1μV. Note detector current.

(4) Set signal generator to 8.6MHz and increase output until detector current reads as in (3). The signal generator output shall be greater than 100μV.

I.F. rejection (B)

97. a. Specification: The receiver output with an input at the i.f. shall be not less than 55dB down on the output with the same input level at the signal frequency.

b. Method: (1) Tune the set to 2.2MHz (L1), set system switch to AM and test switch to 7 o'clock.

(2) Connect the multimeter as in para 95. b. (2).

(3) Set the signal generator to 2.2MHz unmodulated and output level of 3.1μV. Note detector current.

(4) Set signal generator to 500kHz and increase output until detector current reads as in (3). The signal generator output shall be greater than 1.8mV.

A.F. output (p.m.)

98. a. Specification: The output level for a 4μV phase modulated signal (1000Hz deviation at 1000Hz) shall not be less than 320mV.

b. Method: (1) Tune the set to 2.2MHz (L1) and set system switch to PM.

(2) Set test switch to 7 o'clock.

(3) Set the signal generator to 2.2MHz with 1000Hz deviation at 1000Hz and output level of 4μV.

(4) Tune the signal generator to the set.

(5) Note the a.f. valve-voltmeter reading, this shall not be less than 320mV.

(6) Repeat (1) to (5) at 7.6MHz.

A.F. output (a.m.)

99. a. Specification: The output level from a 6.3μV amplitude-modulated signal (70°/o at 1000Hz) shall not be less than 385mV.

b. Method: (1) Tune the set to 2.2MHz (L1) and set system switch to AM.

(2) Set test switch to 7 o'clock.

(3) Set signal generator to 2.2MHz with 70°/o modulation at 1000Hz, and output level 6.3μV.

(4) Tune the signal generator to the set.

(5) Note the a.f. valve-voltmeter reading, this shall not be less than 385mV.

(6) Repeat (1) to (5) at 7.6MHz.

A.F. output (c.w.)

100. a. Specification: The output for a 2μV unmodulated signal with the CW TONE control adjusted for maximum output shall not be less than 385mV.

b. Method: (1) Follow the procedure described in para 99. b. (1) to (4).

(2) Switch set and signal generator to CW and reduce the signal generator output to 2μV.

(3) Vary the CW TONE control for maximum a.f. output as recorded on the a.f. valve voltmeter, this shall not be less than 385mV.

(4) Repeat (1) to (3) at 7.6MHz.

C.W. tone control

101. a. Specification: With a 2μV unmodulated signal input the following shall apply:-

(1) With the CW TONE control set to its centre position the resulting a.f. output shall not exceed 500Hz.

(2) When the CW TONE control is turned in either direction away from its central position a smooth increase in a.f. up to a maximum frequency of 4.2kHz shall result.

b. Method: (1) Follow the procedure described in para 99. b. (1) to (4).

(2) Switch set and signal generator to CW and reduce the signal generator output to 2μV.

(3) By audio means check that with the CW TONE control set to its centre position the note is less than 500Hz and that the maximum frequencies obtained by movement of the CW TONE control in either direction is 4.2kHz.

Receiver a.f. response

102. a. Specification: When the modulating frequency is varied, keeping the deviation on phase modulation at 0.4 radian and the modulation depth on amplitude modulation constant at 30% the output shall be within the following limits:-

Frequency kHz		0.5	1	3	10
Loss rel to Output at 1kHz (dB)	PM	-5 max	0	-7 max	-10 min
	AM	-1	0	-7 max	-10 min

b. Method: (1) Tune the set to 2.2MHz (L1) and set system switch to PM.

(2) Set test switch to 7 o'clock.

(3) Set the signal generator to 2.2MHz with 400Hz deviation at 1000Hz using external modulation and output level 10μV.

(4) Tune the signal generator to the set. Note the a.f. valve-voltmeter reading as A.

(5) Change the signal-generator modulation to 200Hz deviation at 500Hz.

(6) The voltmeter reading shall not be less than A by more than -5dB.

(7) Change the signal-generator modulation to 1200Hz deviation at 3000Hz.

(8) The voltmeter reading shall not be less than A by more than -7dB.

(9) Change the signal-generator modulation to 4000Hz deviation at 10kHz.

(10) The voltmeter reading shall be at least -10dB below A.

(11) Repeat for AM maintaining the modulation depth at 30°/o.

A.G.C. operation

103. a. Specification: When an amplitude modulated signal (30°/o at 1000Hz) is applied to the set and the input level is varied from 6.3μV to 63mV the a.f. output must not vary by more than 10dB.

b. Method: (1) Tune the set to 7.6MHz (H2) and set system switch to AM.

(2) Set test switch to 7 o'clock.

(3) Set the signal generator to 7.6MHz with 30°/o modulation at 1000Hz and output level 6.3μV.

(4) Tune the signal generator to the set. Note the a.f. valve-voltmeter reading.

(5) Set test switch to 8 o'clock and increase signal generator output to 63mV.

(6) Voltmeter reading shall not be more than reading (4).

Limiting

104. a. Specification: When a phase modulated signal (400Hz deviation at 1000Hz) is applied to the set and the input level varied from 4μV to 100mV the a.f. output shall not vary by more than 4dB.

b. Method: (1) Tune the set to 7.5MHz (H2) and set system switch to PM.

(2) Set test switch to 9 o'clock.

(3) Set the signal generator to 7.6MHz with 400Hz deviation at 1000Hz and output level of 4μV.

(4) Tune the signal generator to the set. Note the a.f. valve-voltmeter reading.

(5) Set test switch to 10 o'clock and increase signal generator output to 100mV.

(6) Voltmeter reading shall not be more than reading (4).

Receiver, residual noise

105. a. Specification: With the receiver input terminated with a 75Ω resistor and with no signal applied, the noise output of the receiver with the GAIN control fully clockwise, shall be less than 550mV on AM and less than 865mV on PM.

b. Method: (1) Tune the set to 2.2MHz (L1) and set system switch to AM.

(2) Set test switch to 11 o'clock.

(3) With the terminating unit of the signal generator connected to the test set but the signal generator switched off the reading on the a.f. valve-voltmeter shall be less than 550mV.

(4) Switch to PM the voltmeter reading shall be less than 865mV.

Miscellaneous tests

Netting error

106. a. Specification: The difference between the receiver frequency (ie the signal frequency which produces maximum a.f. output) and the transmitter frequency shall not exceed 1kHz.

b. Method: (1) Tune the set to 7.6MHz (H2) and set system switch to AM.

(2) Set test switch to 12 o'clock.

(3) Measure and record transmitter frequency.

(4) Set test switch to 3 o'clock.

(5) Set the signal generator 7.6MHz with 30% modulation at 1000Hz and output level 6.3μV.

(6) Tune the signal generator for maximum reading on the a.f. valve-voltmeter.

(7) Check the signal generator frequency with a counter, this shall not differ from the transmitter frequency by more than 1kHz.

Power consumption

107. a. Receiver: (1) With the system switch in the TRF position and test switch at 11 o'clock check that the dial illumination is ON. Set meter switch on test set to Rx CURRENT the supply current shall not be greater than 100mA.

(2) Tune the set to 7.6MHz (H2) with system switch in AM, PM or CW position, the supply current shall not be greater than 40mA.

b. Transmitter: (1) With the set tuned to 7.6MHz (H2) on AM, LP and test switch to 12 o'clock, meter the supply current in each of the Tx CURRENT positions. The sum of these currents shall not exceed 1.1A.

(2) Repeat for PM and CW, the sum of the three currents shall not exceed 1.2A.

(3) Switch to AM, HP the supply current from PSU1 shall not exceed 1.2A and the sum of the supply currents from PSU2 and 3 shall not exceed 1.5A.

(4) Switch to PM HP, the supply current from each p.s.u. shall not exceed 1.2A. Repeat for CW HP.

Tuning scale calibration

108. Switch the set to TRF, BAND switch to H and CHANNEL switch to F. Rotate the tuning control until the 6.5MHz point is under the cursor. Connect the counter to test point 22 module K and measure the local oscillator frequency. The error from the nominal frequency of 7MHz shall not be greater than ±105kHz.

ELECTRICAL ADJUSTMENTS AND ALIGNMENT

General

109. The electrical alignment and adjustments should be carried out in the following order:-

a. I.F. and a.f. (modules J and C).

b. Filter (module F).

c. Discriminator (module D).

d. Free-tune oscillator and crystal oscillator (modules L and K).

e. Receiver r.f. (module M).

f. Receiver gain setting (module J).

g. Sidestep oscillator and b.f.o. (module G).

h. Driver and p.a. (modules M and L).

j. Transmitter mixer balance setting (module M).

k. Transmitter alignment (modules M and L).

l. Modulation and sidetone (module C).

m. Modulation AM HP (amplifier r.f.).

110. All alignment must be carried out with a supply voltage of 12.6V unless otherwise stated.

111. The gain control is to be at maximum unless otherwise stated.

112. The CW TONE control is normally set to the control position.

113. No securing pastes, varnishes or paints should be used on the cores or trimmers.

I.F. and a.f. (modules J and C)

114. a. Switch the set off and connect multimeter (set to resistance (OHMS)) between VT7 emitter and chassis (+ve terminal to chassis). Adjust RV1 to read 3.3kΩ. Remove multimeter.

b. Switch the set on and connect multimeter (set to 30V d.c. range) between VT7 collector and chassis. Short-circuit test points J20 to TP J21 and adjust RV2 for 11 volts at VT7 collector. Remove short-circuit. Remove AVO.

c. Set the channel switch to position T, and test set switch to 7 o'clock.

d. Remove the link between terminals G22 and G23 and connect multimeter (set to 50μA d.c. range) in place of the link. (+ve Terminal to 22).

e. Connect the signal generator to test points J15 and J20 (earth to 20).

f. With an unmodulated signal of 500kHz at 20μV, adjust T6 and T7 for maximum detector current. Note this reading.

g. Increase the signal generator output by 6dB and de-tune the signal generator each side of 500kHz until the detector current falls to level noted at f. Check that the two frequencies are not closer than 4kHz to the centre frequency and that they are symmetrical within ±800Hz. If the pass-band (bandwidth) is not symmetrical, correct by adjustment of T7.

h. Set the signal generator to 500kHz with 30°/o modulation at a 1000Hz and output level of 20μV. The audio output on the a.f. valve-voltmeter should not be less than 245mV.

Filter (module F)

115. a. Set the band switch to L and the channel switch to T. Switch Test Set to 3 o'clock.

b. Connect the multimeter and signal generator as detailed in para 114 d. e.

c. With an unmodulated signal of 500kHz adjust the signal generator output for a detector current of 5μA. Note the signal generator output, call this reading V1.

d. Link terminals F8 and F9 and connect the signal generator, via a 0.1μF capacitor, between terminal F8 and chassis.

e. With an unmodulated signal of 500kHz adjust the signal generator output for a detector current of 5μA. Note the signal generator output V2. This should not be greater than reading V1.

f. Increase the signal generator output by 6dB and detune the signal generator above and below 500kHz and note the frequencies at which the detector current is again 5μA, these frequencies should be at least 3kHz away from the centre frequency.

g. Tune the signal generator to 490kHz and increase output level until detector current is 5μA. Note the signal generator output, this should be at least 65dB up on V2.

h. Repeat g. at 510kHz.

j. If the filter fails to meet the required specification it should be replaced. Realignment will be carried out at Base workshops only.

Discriminator (module D)

116. a. Set the system switch to PM.

b. Connect the signal generator to test points J15 and J20.

c. Connect the CT569 between test points D4 and D7 (+ve to D4).

d. With an unmodulated signal of 500kHz at a level of 200μV adjust T8 until the valve-voltmeter reads +1 Volt.

e. Adjust L7 for maximum meter deflection.

f. Re-adjust T8 for centre zero.

g. Check discriminator response against the following table: symmetry may be adjusted by L7.

Frequency kHz	496	499	501	504
Reading V min	-6V	-2V	+2V	+6V

h. Note the signal frequency corresponding to both positive and negative peak deflections of the meter. Peak separation shall be not less than 8kHz.

j. Connect Voltmeter Set, Electronic, (Marconi TF2600/S) between test point D8 and earth. Set the gain control fully anti-clockwise. With a 500kHz signal deviated 1kHz at 1kHz and at a level of 200μV the a.f. voltage at D8 should not be less than 8mV.

k. Re-connect the valve-voltmeter (TF2600/S) to the AF VV socket on the test set. Set the test switch to 7 o'clock with the same input as in j. The a.f. output, with the gain control fully clockwise, should not be less than 550mV.

l. Increase the input signal by 10dB the increase in a.f. output should not be greater than 2dB.

Free tune oscillator (modules L and K)

117. a. Before attempting to track the free tune oscillator ensure that the tuning scale is fitted correctly (para 34. e.).

b. Connect the frequency counter between TP25 on module K and earth.

c. Set band switch to L, channel switch to 1, system switch to TRF and rotate tuning until the 2.2MHz marker is directly under the cursor.

d. Adjust L10 for a reading of 2.7MHz on the counter.

e. Set Band Switch to H and adjust L11 for 4.9MHz.

f. Set tuning scale to 7.6MHz.

g. Adjust C89 for 8.1MHz.

h. Set Band switch to L and adjust C85 for 4.3MHz.

j. Repeat c. to h. until no further improvement is possible.

Receiver r.f. (module M)

118. a. Remove the link between terminals G22 and G23 and connect a multimeter set to 50μA d.c., in place of the link (+ve terminal to 22).

b. Connect the signal generator to SIG GEN socket on the test set and set test switch to 3 o'clock.

c. Tune the set to 2.2MHz (L1) and switch to AM.

d. Set the signal generator to 2.2MHz unmodulated at a level of 6.3μV.

e. Connect a counter to test points J6 and J7 and adjust the signal generator frequency until the i.f. is exactly 500kHz. Disconnect the counter.

f. Adjust T1 and T3 for maximum detector current, reducing the r.f. input level as necessary to keep detector current at about 8μA.

NOTE: T1, T2, T3 and T4 have two tuning points, select the point with the core nearest to the bottom of the coil former.

g. Tune set to 4.4MHz (H1).

h. Tune the signal generator to 4.4MHz using the counter as in e.

j. Adjust T2 and T4 for maximum detector current.

k. Tune set and signal generator to 7.6MHz (H2) and adjust C9 and C16 for maximum detector current.

l. Tune set and signal generator to 3.8MHz (L2) and adjust C6 and C13 for maximum detector current.

m. Repeat d. to e. until no further improvement can be made.

Receiver gain setting (module J)

119. a. Tune the set to 7.6MHz (H2) and switch to AM.

b. Connect the signal generator to SIG GEN socket on the test box and set test switch to 7 o'clock.

c. Set the signal generator to 7.6MHz modulated 30°/o at 1000Hz and input level of 6.3µV.

d. Adjust the signal generator frequency for a maximum reading on the a.f. valve-voltmeter.

e. Adjust RV2 to give a reading of between 385 and 545mV.

f. Increase the signal generator output to 63mV, adjust RV1 so that the increase in a.f. output is not greater than 10dB.

g. Reduce input to 6.3µV and check that a.f. output is still within the limits quoted at e.

h. Adjust RV1 and RV2 as necessary until both a.f. output and a.g.c. requirements are met.

Side step oscillator and b.f.o. (module G)

120. a. Set system switch to CW and CHANNEL switch to T.

b. Connect the frequency counter to test point J9.

c. Link test point J20 to J21. Link test point D10 to D14.

d. Connect the CT569 between test point D2 and chassis (+ve to test point 2).

e. Adjust RV3 for a reading of 2.5V on the valve-voltmeter.

f. Set test switch to 12 o'clock and adjust T21 so that the counter reads 500kHz.

g. Remove the link between test points D10 and D14, adjust T8 so that the counter reads 500kHz. No further adjustment should be made to T8 during the further test procedure, unless for some reason the general alignment of the set has to be repeated.

h. Set test switch to 3 o'clock and adjust CW TONE control for a counter reading of 500kHz. Loosen the control knob and reposition it so that the pointer registers against the dot on the front panel. Tighten the Knob and check that the counter still reads 500kHz.

j. Note the counter reading for extreme positions of the CW TONE control, the deviation from 500kHz must be at least ±4.2kHz.

k. Remove the link between test points J20 and J21.

Driver and p.a. (module M and L)

121. a. Set the pointer of the RF TRIM control to coincide with the dot on the front panel and check that the vanes of C65 are half-meshed.

b. Disconnect the co-axial cable from terminal C30 and connect the signal generator to test point C31.

c. Tune the set to 2.2MHz (L1) switch to PM and set test switch to 12 o'clock.

d. Tune the signal generator to 2.2MHz and adjust T16 and T9 for maximum output on r.f. valve-voltmeter, adjusting the input level from the signal generator so that the voltmeter reading does not exceed 12V.

NOTE: Two tuning positions will be found for the cores of T9, T10, T16 and T17. Cores should be set to the tuning position nearest to the base of the coil former.

e. Tune the set to 4.4MHz (H1), inject a 4.4MHz signal and adjust T17 and T10 similarily for maximum output.

f. Tune the set to 7.6MHz (H2), inject a 7.6MHz signal and adjust C109 and C67 for maximum output.

g. Tune the set to 3.8MHz (L2), inject a 3.8MHz signal and adjust C105 and C62 for maximum output.

h. Repeat c to g until no further adjustment is required.

j. Disconnect the signal generator and reconnect the co-axial cable to terminal C30.

Transmitter mixer balance setting (module M)

122. a. Render the 500kHz oscillator in-operative by disconnecting the link between test points G13 and G14.

b. Remove the transmitter driver supply by disconnecting the orange lead with a yellow sleeve from terminal 2 of T11 (Module C).

c. Connect a valve-voltmeter TF2600/S) between terminals M25 and M27 (+ve).

d. Switch to channel H2, set system switch to TRF and tune set as normal.

e. Set system switch to PM and Test switch to 12 o'clock.

f. Adjust RV10 for a minimum reading on the valve-voltmeter, approximately 60mV.

NOTE: RV10 is located between Modules G and K.

g. Reconnect leads to test points G13 and G14 and terminal 2 of T11.

Transmitter alignment (modules M and L)

123. a. Set the pointer on the RF TRIM control against the dot on the front panel.

b. Tune the set to 2.2MHz (L1) switch to PM.

c. Set the test switch to 12 o'clock and adjust T19 for maximum reading on r.f. valve voltmeter. Check tuning of T16 and T9 for maximum reading.

d. Tune the set to 4.4MHz (H1) and adjust T20 for maximum output. Check tuning of T17 and T10.

e. Tune the set to 7.6MHz (H2) and adjust C118 for maximum output. Check tuning of C109 and C67.

f. Tune the set to 3.8MHz (L2) and adjust C114 for maximum output. Check tuning of C105 and C62.

g. Repeat b. to f. until no further adjustment is necessary.

h. Set BAND switch to L, CHANNEL switch to F and tune over the whole frequency range. No sudden changes of output power should be detected.

j. Repeat h. with BAND switch at H.

Modulation and sidetone (module C)

124. a. Set the Sig gen v.f. No 1 to 1kHz and carry out procedure detailed in para 88. b. (1) to (3) so that the input to the modulator is 10mV when Test switch is at 1 o'clock and 100mV at 2 o'clock.

b. Tune the set to 7.6MHz (H2) and switch to AM LP.

c. Set test switch to 1 o'clock and adjust RV9 for a reading of 120 to 150mV on the a.f. valve-voltmeter.

d. Connect an oscilloscope to the COUNTER socket on the test set and set test switch to 2 o'clock.

e. Adjust RV5 until limiting occurs, ie modulation depth does not increase with further adjustment of RV5.

NOTE: If modulation limiting occurs at any setting of RV5, turn RV4 slightly counter clockwise.

f. Set test switch to 1 o'clock and check the modulation depth is not less than 40°/o.

g. If the modulation depth is less than 40°/o turn RV4 clockwise until modulation depth is 40°/o.

h. Repeat c to f

j. Switch the set to PM, test switch to 1 o'clock and adjust RV11 for a deviation of 1kHz.

k. Set test switch to 2 o'clock the deviation should be less than 1.5kHz.

Modulation a.m. h.p. (amplifier r.f.)

125. a. Carry out procedure detailed in para 124. a.

b. Tune the set to 7.6MHz (H2) and switch to AM HP.

c. Set test switch to 1 o'clock and adjust RV1 for a modulation depth of 70°/o.

d. Set test switch to 2 o'clock and check modulation depth does not exceed 100°/o.

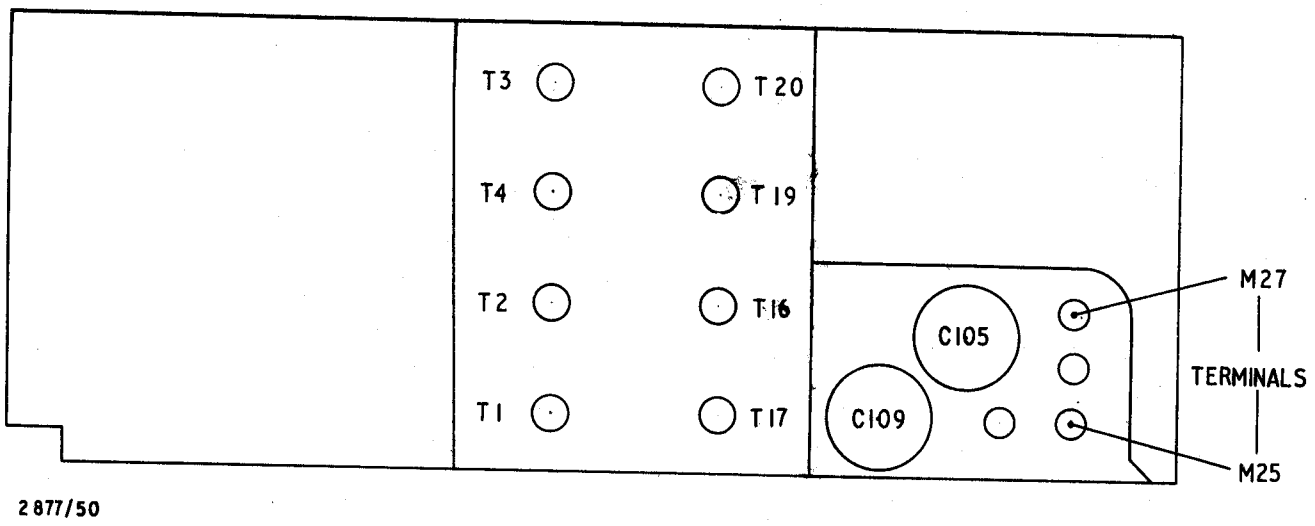

Fig 4 - Alignment test points module M

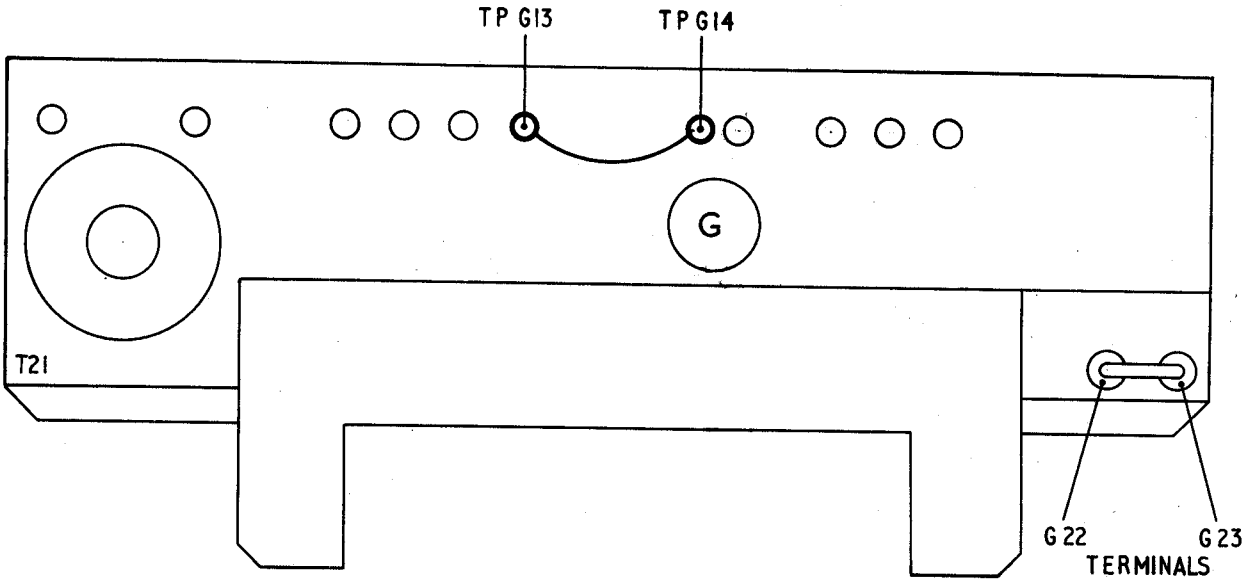

Fig 5 - Alignment test points module G

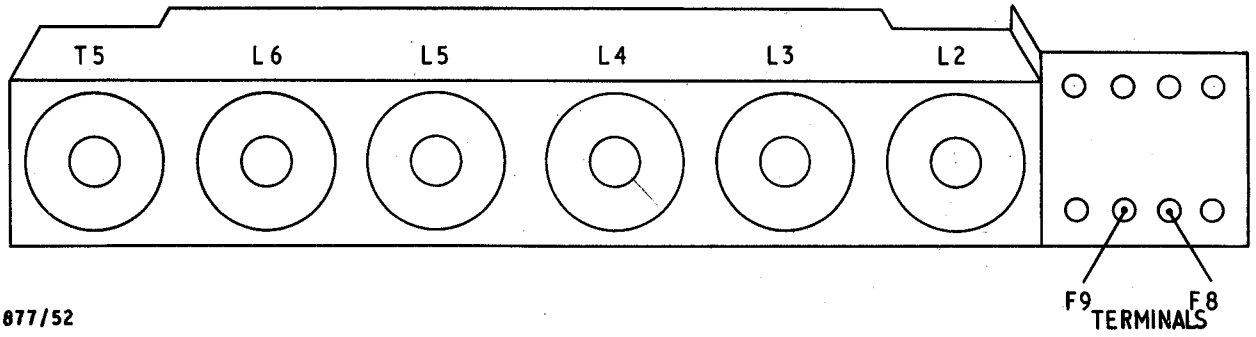

Fig 6 - Alignment test points module F

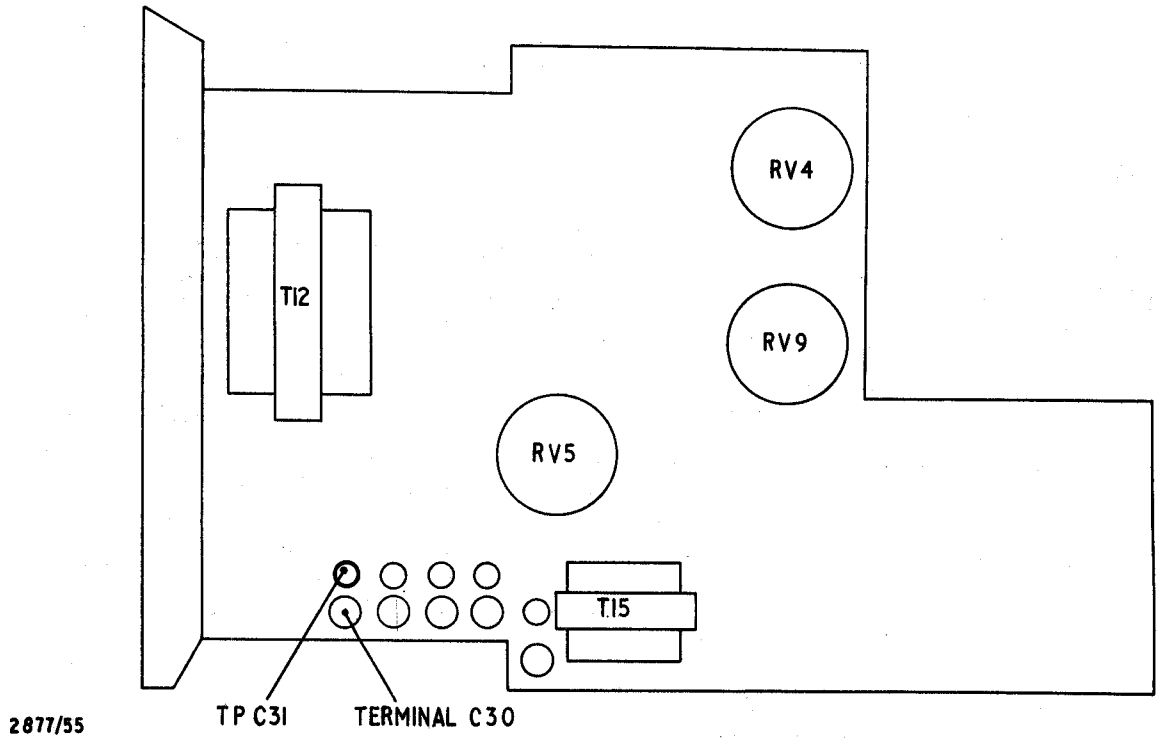

Fig 7 - Alignment test points module C

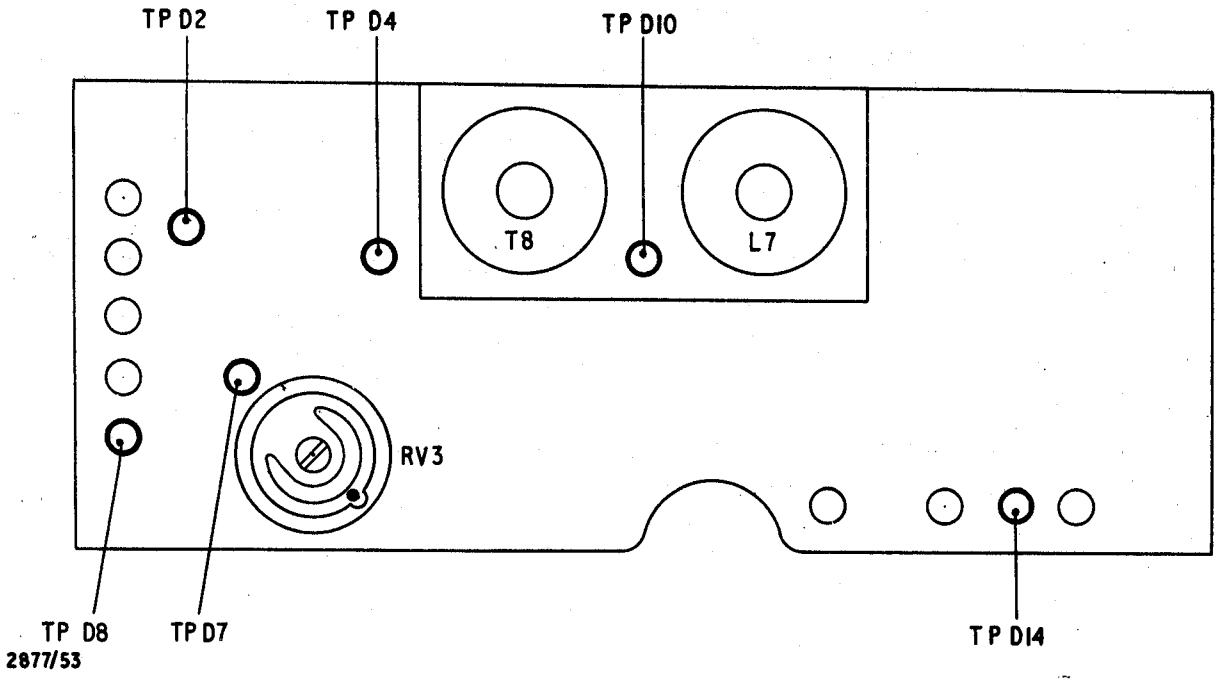

Fig 8 - Alignment test points module D

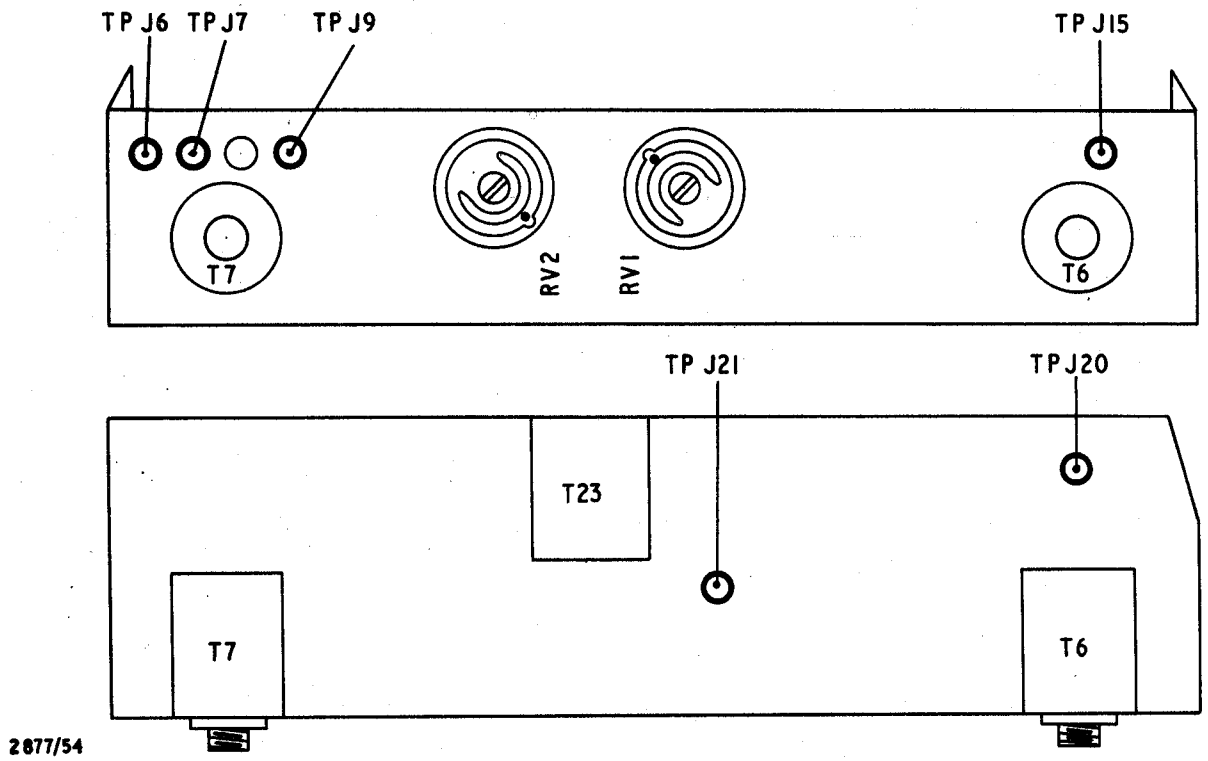

Fig 9 - Alignment test points module J

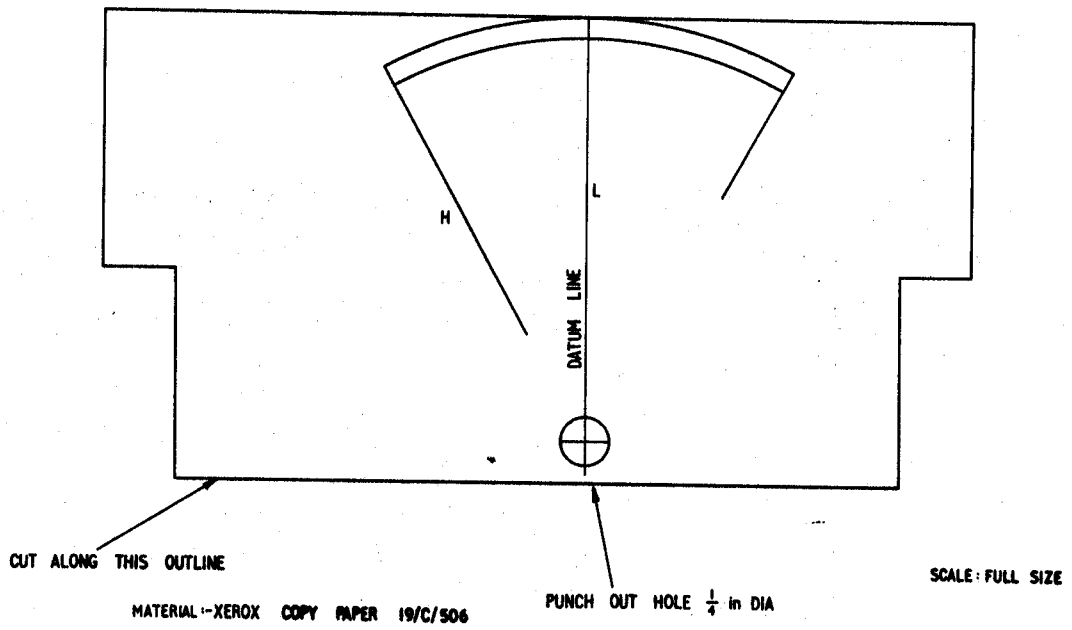

Fig 10 - Band switch alignment, calibrated scale

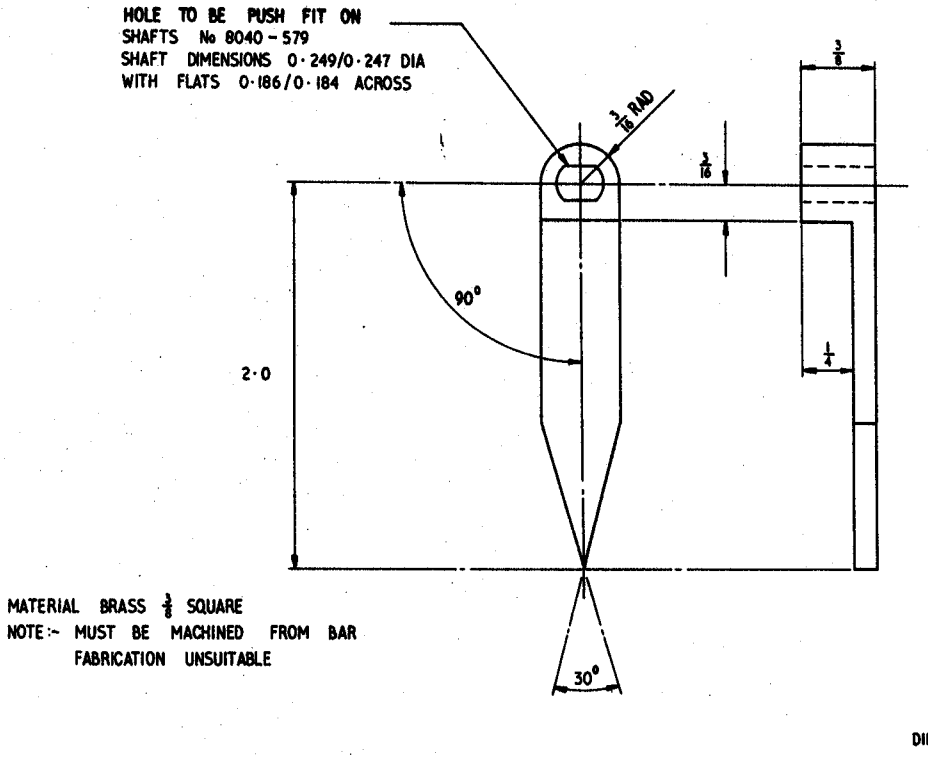

Fig 11 - Band switch alignment, pointer

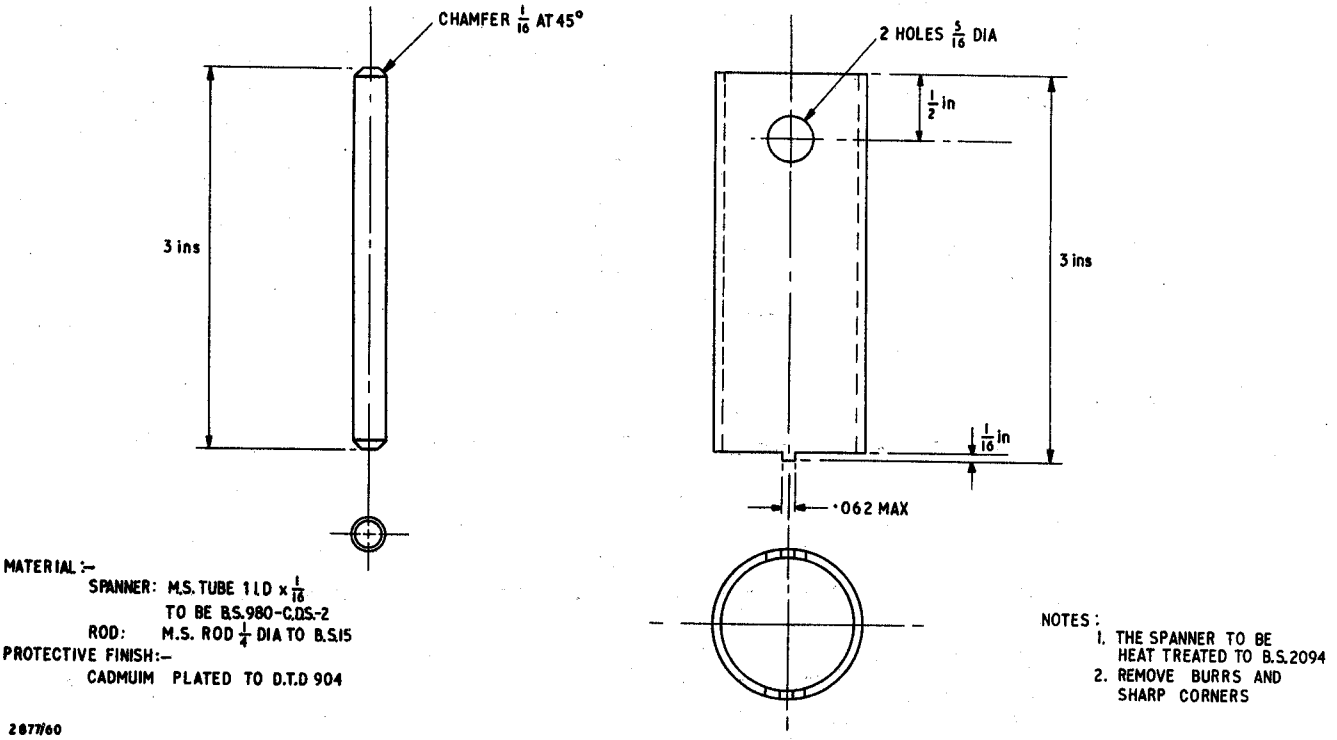

Fig 12 - Detail of meter spanner

SECTION 2 - TUNER RF ANTENNA NO 15

INSTRUCTIONS FOR DRYING AND SEALING

126. Carry out the procedures detailed in paras 9-18.

MECHANICAL REPAIRS AND REPLACEMENTS

To remove unit from its case

127. Using a 3/32 in. AF wrench, release the four socket-headed screws securing the tuner to its case.

128. Carefully withdraw the unit from the case, unplugging the meter leads from the sockets on the component board.

To remove the coil assembly

129. a. Turn the tuning control fully clockwise.

b. Remove the tuning knob.

c. Unsolder the link between chassis and the front terminal board.

d. Unsolder the braid from front terminal board to antenna output socket.

e. Unsolder the four grey wires and one blue wire from the switch assembly.

f. Remove the socket-headed screw securing the front board to the panel and the screw securing the coil assembly to the fibre glass mounting plate.

g. Using a 1/4 in. Whitworth box spanner release the nut securing the shaft and seal to the front panel.

h. Remove the coil assembly.

To remove the component board

130. a. Unsolder the co-axial connector from the r.f. input socket on the underside of the board.

b. Unsolder the grey wire from upper side of the board to the coil assembly and the short link to the switch.

c. Remove the two nuts securing the long socket-headed screws which hold the component board to the switch assembly pillars. Remove the screws.

d. Unsolder the grey wire from terminal 4 and blue wire from terminal 6 of the switch.

e. Remove the component board.

To remove the switch wafer

131. a. Carry out operations as detailed in para 130.

b. Unsolder the remaining wires from the switch wafer and lift the switch wafer off its shaft.

To remove the meter

132. Remove the four hexagon-headed screws securing the meter clamping plate to the case and withdraw the meter.

SPECIFICATION TESTS

General

133. These tests are required at Field, Intermediate and Base level except those given in para 134.

Frequency coverage and efficiency

(Intermediate and Base only)

134. a. Specification: The frequencies (at maximum and minimum inductance) and the efficiency shall be as follows:-

Freq band	Inductance	Frequency MHz	% Efficiency (main)
A	Max	Not greater than 1.7	25
A	Min	Not less than 4.1	40
B	Max	Not greater than 4.0	30
B	Min	Not less than 9.0	50
C	Max	Not greater than 8.0	20
C	Min	Not less than 14.0	50

b. Method: (1) Remove the tuner from its case.

(2) Short-circuit C3 and insert a short-circuited plug into the input socket (SKT A).

(3) Connect Panel, test, electrical, (Q Meter) between SKT A and the antenna socket, earthing terminal to SKT A. Set the Q meter capacity dial to 40pF.

(4) Set the frequency range switch on the tuner to A and rotate the tuning fully clockwise (maximum inductance).

(5) Tune the Q meter to find the resonant frequency which must be not greater than 1.7MHz.

(6) Measure and record the Q at this frequency.

(7) Rotate the tuning control fully anti-clockwise (minimum inductance).

(8) Tune the Q meter to find the resonant frequency; this must be not less than 4.1MHz. Record the Q at this frequency.

(9) Repeat (4) to (8) with the frequency range switch set to B and then at C. The frequencies must conform with the table at (a).

(10) Insert a 10Ω non-inductive resistor between the antenna socket and the Q meter and repeat (4) to (9) recording the new value of Q at each point.

(11) The efficiency is given by:

$$\text{Efficiency} = \frac{Qo - QL}{Qo} \times 100\%$$

Qo = original Q

QL = Q with 10Ω resistor

The efficiency at each point must not be less than the figures quoted in the table at (a).

(12) Remove shorting connections from SKT A and C3.

Full-power test

135. a. Specification: The efficiency of the tuner when operating on full load will be as follows:- 2.1MHz not less than 20%
6.1MHz not less than 40%

b. Method: (1) Connect a Wattmeter h.f. No 2 to the output of the amplifier r.f.

(2) Tune the set to 2.1MHz, switch to transmit c.w., h.p. and record the power output (Po).

(3) Connect the tuner to the amplifier r.f. output socket.

(4) Connect a dummy load comprising a 10Ω resistor in series with a 40pF capacitor (taken from Test kit, radio, vehicle and manpack radio sets) between the antenna socket and case of the tuner. Connect a valve-voltmeter across the 10Ω resistor.

(5) With the frequency band switch at A, tune for maximum reading on the tuner meter.

(6) Measure the voltage across the 10Ω resistor (VL), the efficiency is given by:

$$\text{Efficiency} = \frac{VL^2}{10Po} \times 100\%$$

(7) Repeat (1) to (6) at a frequency of 6.1MHz with the tuner frequency band switch at B.

SECTION 3 - HAND GENERATOR

INSTRUCTIONS FOR DRYING AND SEALING

136. On receipt for repair, the generator should be pressurised to 5 lb/sq in. and a dip test carried out in a water tank. This should reveal any leaky spindle seals, casting pin-holes etc. This inspection should be carried out thoroughly with the generator immersed for at least five minutes. The addition of a small amount of wetting agent to the water is recommended.

137. The generator should now be open and all necessary mechanical repairs and adjustments carried out in the driest possible conditions.

138. After specification testing the generator should be re-sealed into its case the sealing gasket should be replaced if damaged during stripping of the generator.

139. The desiccator plug is now removed and the appropriate adapter from the leak locator fitted.

140. The generator is now pressurised to 2.5 lb/sq in. using dry air from the oven drying to pressurise the unit.

141. After a period of 48 hours the pressure should not have reduced below 2.2 lb/sq in. (after applying temperature/pressure correction as detailed in Tels M 631).

142. Finally, remove the adapter, fit a reactivated 1.1/4 in. silica-gel desiccator (4440-99-942-2061). Lightly smear the sealing ring with Grease, silicon compound MS4 and screw the plug firmly into the case.

MECHANICAL REPAIRS AND REPLACEMENTS

To remove the side covers

143. a. Remove the handles by tapping out the securing pins using a light hammer and a pin punch. Great care should be taken to ensure that the spindle is not damaged during this operation.

b. Remove the ten socket-headed screws securing the side plate and remove the plate.

c. On reassembly apply Grease, silicon compound MS4 to the drive spindle oil seal.

To remove the component board

144. a. Remove the right-hand side plate as viewed with the output socket facing to the front.

b. Carefully ease the board clear of the generator and remove the three nuts to release the blue, yellow and red leads from the generator to MR4, MR5 and MR6 respectively.

c. Unsolder the connections to the warning lamp and output socket.

d. Remove the component board.

To remove the generator assembly

145. a. Remove both side plates.

b. Remove the three nuts to release the blue, yellow, and red leads from the generator to MR4, MR5, and MR6.

c. Remove the four socket-headed screws securing the generator assembly to the casing and withdraw the assembly.

To remove the reduction gears

146. a. Remove the left hand side plate as viewed with the output socket facing to the front.

b. Using a light hammer and a pin punch, tap out the pin securing the drive gear to the drive shaft.

c. Remove the gear from the drive shaft. A puller will be needed for this operation.

d. Remove the intermediate gear.

e. No attempt will be made to clean out the bearings and gear wheels as these are coated with a protective film of molybdenum disulphide grease. If any gear wheels or bearings are replaced they must be re-lubricated with Grease ZX28 (H1/8030-99-943-7518).

SPECIFICATION TESTS

147. The full testing of the hand generator requires a mechanical means of rotating its handles at speeds varying between 60 and 80 rev/min. Workshops holding the test stand, automotive generator and starter will use this: other workshops must improvise locally or turn the handles manually, in which case it may not be possible to apply some tests.

O/C test

148. a. Specification:

(1) When the generator is turned at 60 rev/min the o/c voltage shall be between 14.0 to 14.4V.

(2) With the generator turned at 70 rev/min the o/c voltage shall not exceed 15.5V.

b. Method:

(1) Connect multimeter to the output socket of the generator.

(2) Turn the generator at 60 rev/min, or manually at a speed sufficient to extinguish the indicator light.

(3) The lamp is to be extinguished and the output voltage indicated on the multimeter must be between 14.0 and 14.4V.

(4) Turn the generator at 70 rev/min; the lamp remains unlit and the output voltage indicated on the Avo shall not exceed 15.5V.

Average load test

149. a. Specification: With the output of the generator terminated with a 56Ω resistor and the handles turned at 60 rev/min the output voltage shall be not less than 12.6V.

b. Method:

(1) Connect a 56Ω ±10°/o 10W resistor across the output of the generator.

(2) Connect multimeter across the 56Ω resistor.

(3) Turn the generator at 60 rev/min or until the indicator light is just extinguished.

(4) The output voltage across the 56Ω resistor shall be not less than 12.6V.

On-load test

150. a. Specification:

(1) With the output of the generator terminated with a 7.5Ω resistor and the handles turned at 65 rev/min the output voltage shall be not less than 10.0V.

(2) The speed at which the indicator light is extinguished shall be between 60 and 75 rev/min.

b. Method:

(1) Connect a 7.5Ω ±10°/o 15W resistor across the output of the generator.

(2) Connect multimeter across the 7.5Ω resistor.

(3) Turn the generator at 65 rev/min, the output voltage across the 7.5Ω resistor shall be not less than 10.0V.

(4) Turn the generator until the indicator light is extinguished; the cranking speed shall be between 60 and 75 rev/min.

Overload test

151. a. Specification: With the output of the generator terminated with a load of 0.05-0.1Ω and the generator turned at 50 rev/min the short-circuit current shall be not greater than 7.0A.

b. Method:

(1) Connect multimeter set to 10A d.c. range across the output of the generator.

(2) Turn the generator at 50 rev/min; the current shall be not greater than 7.0A. The test must not be continued for more than 1 minute.

Protection circuit test

152. a. Specification: With a d.c. source of 14.5V connected to the output of the generator and the generator inoperative the current flowing from the d.c. source shall be not greater than 25μA.

b. Method:

(1) Connect a d.c. source of 14.5V with the multimeter in series to the output socket of the generator ensuring correct polarity.

(2) Do not crank the generator, the current flowing from the d.c. source shall be not greater than 25μA.

R.F. ripple voltage

153. a. Specification: With the output of the generator terminated in a 56Ω resistor and the generator turned at sufficient speed to extinguish the indicator light, the output ripple voltage shall be not greater than 90mV peak to peak.

b. Method:

(1) Connect a 56Ω ±10°/o 10W resistor across the output of the generator.

(2) Connect an oscilloscope CT436 across the 56Ω resistor.

(3) Turn the generator at sufficient speed to extinguish the indicator light.

(4) The ripple voltage as measured by the oscilloscope shall be not greater than 90mV peak to peak.

ELECTRICAL ADJUSTMENTS

O/C voltage setting

154. a. Remove the right-hand cover plate to gain access to the component board.

b. Connect multimeter to the output socket of the generator.

c. Rotate the generator at 60 rev/min; the indicator light should be extinguished; if not, adjust RV1.

d. Adjust RV2 so that the o/c voltage is 14.2V.

Indicator light setting

155. a. Connect a 56Ω ±10°/o 10W resistor across the output of the generator.

b. Rotate the handle at 60 rev/min.

c. Adjust RV1 so that the indicator light just dims out.

SECTION 4 - REMOTE CONTROL UNITS

INSTRUCTIONS FOR DRYING AND SEALING

156. Carry out the procedures detailed in para 9-18.

SPECIFICATION TESTS

General

157. The tests are based on the use of a box testing, remote control units, S.R.A.14, which is part of the test kit, radio, S.R.A.14.

Test conditions

158. All tests are carried out with a 12.6V d.c. supply connected to the test box unless otherwise stated. This supply is derived from the test set, radio, S.R.A.14.

Control, radio set, remote control unit 513L

159. To test this unit, the test equipment should be arranged as shown in Fig 13.

WARNING

Ensure the LOCAL/REMOTE switch on the box, testing is set to LOCAL before switching on power to the test set, as damage to the transistors may result with the switch in the REMOTE position and the connections between TPs 1 and 2 and the line terminals of the RCU incorrectly connected.

Receive path gain measurement

160. a. Specification: With an input of 500mV at 1kHz, the output voltage to the line terminals shall be between 300 and 600mV.

b. Method:

(1) Set the LOCAL/REMOTE switch on the box, testing to LOCAL.

(2) Set the Tx/Rx switch on the box, testing to Rx.

(3) Set the RT/CW switch on the RCU 513L to RT.

(4) Set the SUPPLY VOLTS switch on the test set to 12.6 and switch on the mains input.

(5) Set the sig gen v.f. No 1 to 1kHz.

(6) Depress the SET AF LEVEL switch on the box, testing and adjust the output of the sig gen VF No 1 to give a reading of 400mV on the valve-voltmeter (set to the 1V range).

(7) Release the SET AF LEVEL switch, the output now indicated by the valve-voltmeter shall be between 300 and 600mV.

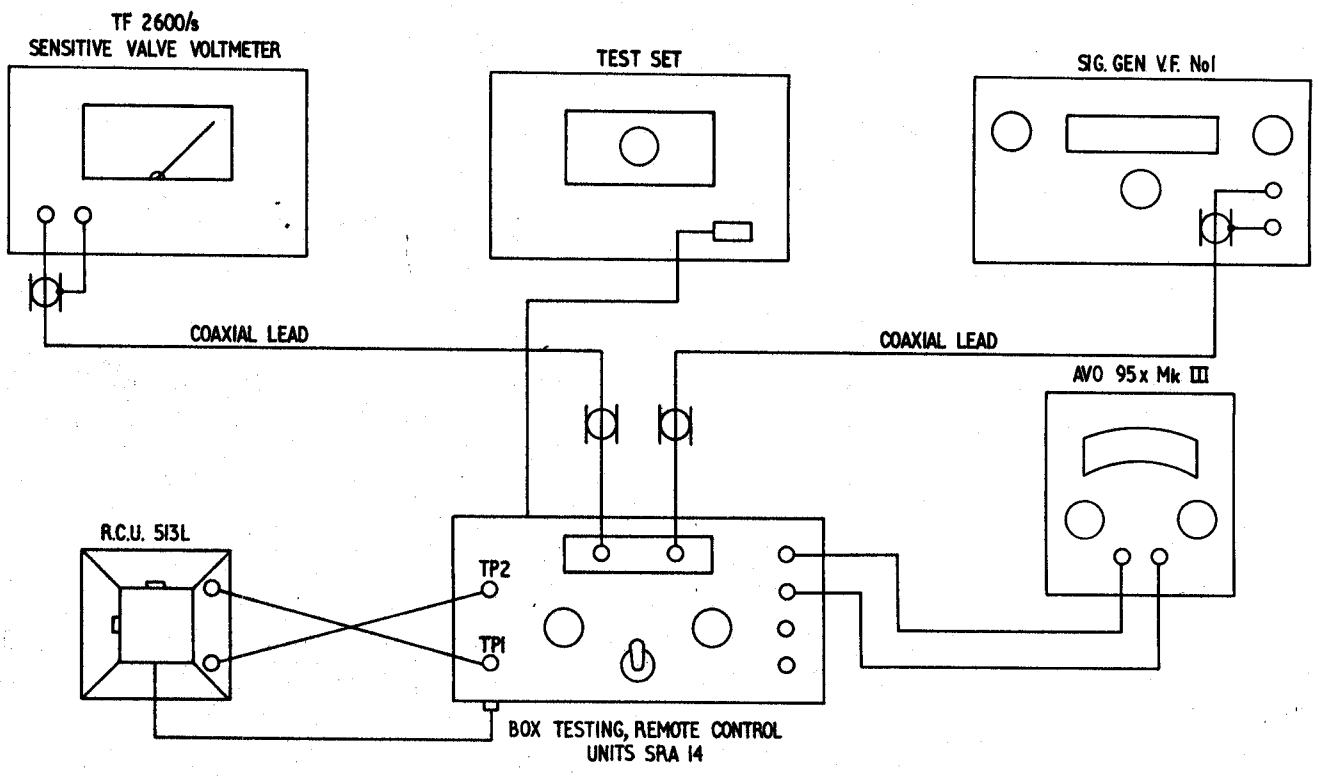

Fig 13 - Control radio set, remote control unit 513L, test gear arrangement

(8) Set the SUPPLY VOLTS switch to 10.5 and repeat (6) and (7). Return SUPPLY VOLTS switch to 12.6.

Note: If a very low reading, of the order of 5mV, is obtained, it may be due to incorrect connections between TPs 1 and 2 and the line terminals of the RCU.

Send path loss measurement

161. a. Specification: With an input of 300mV at 1kHz, the output voltage (to the microphone input) shall be between 60 and 100mV.

b. Method:

(1) Set the Tx/Rx switch to Tx.

(2) Depress the SET AF LEVEL switch and adjust the output of the Sig Gen VF No 1 to give a reading of 300mV on the valve-voltmeter.

(3) Release the SET AF LEVEL switch; the output now indicated by the valve-voltmeter shall be between 60 and 100mV.

(4) Set SUPPLY VOLTS switch to 10.5 and repeat (2) and (3). Return SUPPLY VOLTS switch to 12.6.

(5) Reduce output of sig gen v.f. No 1 to zero.

Operation of send/receive relay

162. a. Specification: With a resistance of 1.5kΩ connected across the line terminals of the remote control unit, the send/receive relay shall operate.

b. Method:

(1) Set the multimeter to resistance range.

(2) Set the Tx/Rx switch to Rx, the multimeter shall indicate an O/C.

(3) Set the Tx/Rx switch to Tx, the multimeter shall indicate a S/C.

Interconnecting box, remote control unit 513R

163. To test this unit, the test equipment should be arranged as shown in Fig 14.

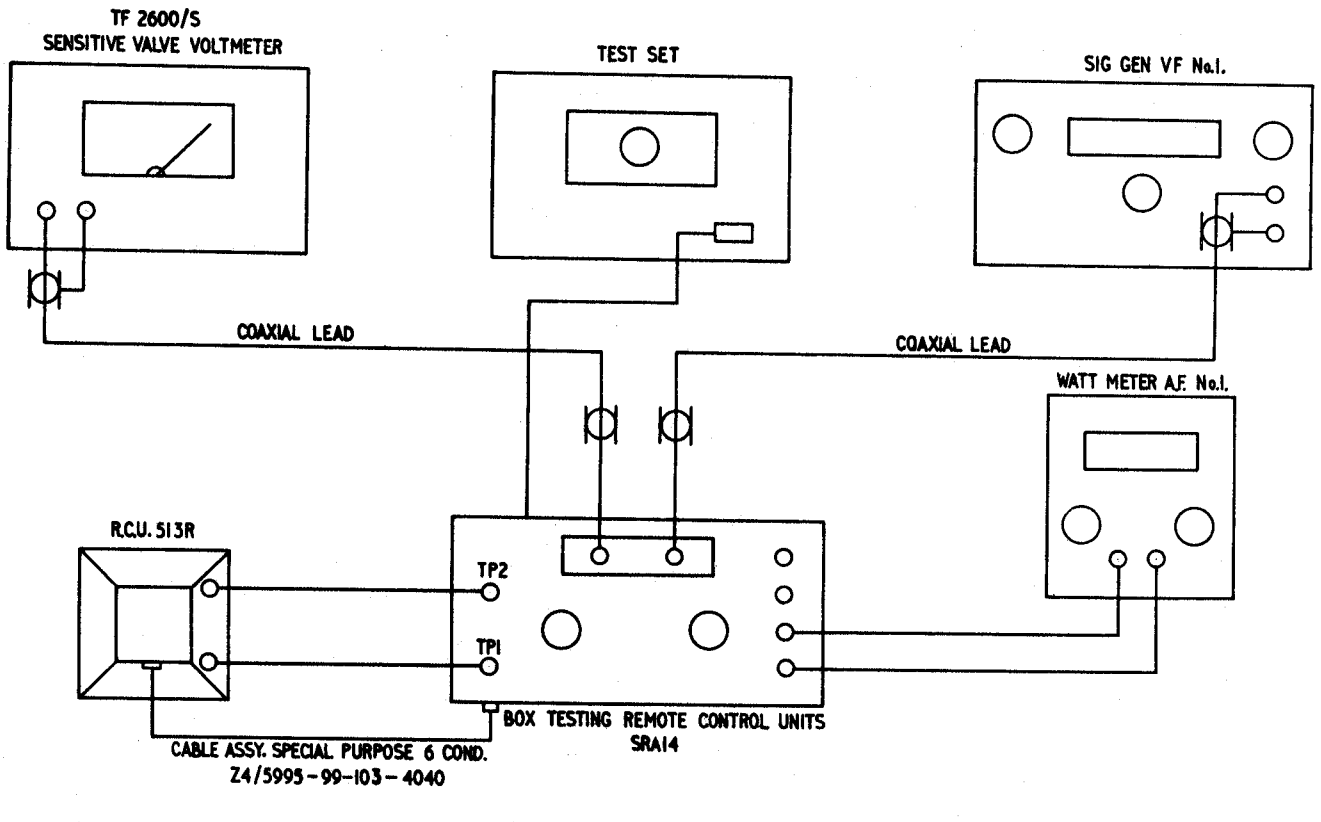

Fig 14 - Interconnecting box, remote control unit 513R, test gear arrangement

Voltage gain and power output

164. a. Specification: With an input of 100mV at 1kHz the output at the line terminals shall be between 170 and 400mV, and the power output across 150Ω shall be between 0.2 and 1mW.

b. Method:

(1) Set the LOCAL/REMOTE switch on the Box testing to REMOTE.

(2) Set the Tx/Rx switch on the box testing to Rx.

(3) Set the SUPPLY VOLTS switch on the test set to 12.6 and switch on the mains input.

(4) Set the METER switch on the test set to RX CURRENT and depress the 100mA. If a full scale deflection results it may be due to incorrect connections between TPs 1 and 2 and the line terminals of the RCU.

(5) Set the impedance of the a.f. wattmeter to 150Ω.

(6) Set the sig gen v.f. No 1 to 1kHz.

(7) Depress the SET AF LEVEL switch and adjust the output of the sig gen v.f. No 1 to give a reading of 100mV on the valve-voltmeter. Valve-voltmeter set to 1 volt range.

(8) Release the SET AF LEVEL switch, the output now indicated by the valve-voltmeter shall be between 170 and 400mV.

(9) The power output as measured on the a.f. wattmeter shall be between 0.2 and 1mW.

(10) Set SUPPLY VOLTS switch to 10.5 and repeat (7) to (9).

SECTION 5 - 12/24V D.C. BATTERY CHARGER

INSTRUCTIONS FOR DRYING AND SEALING

165. Carry out procedures detailed in paras 9-18.

MECHANICAL REPAIRS AND REPLACEMENTS

To remove component board

166. Release the four socket-headed screws securing the base plate and remove.

167. Remove the five socket-headed screws securing the component board to the heat sink assembly and hinge the board over.

168. Unsolder the sixteen fork-ended tags from terminals 3 to 18 and remove the component board.

To remove heat sink assembly

169. With the component board hinged away release the eight socket-headed screws securing the assembly to the front panel.

170. Unsolder the nine fork-ended tags from terminals 27 to 35 on the transformer terminal board and remove component board and heat sink assembly.

171. About nine inches of freedom are allowed for in the length of the cableform between the assembly and main case so that the assembly can be placed at the side of the case. All components are then easily accessible.

To remove transformer and voltage selector socket

172. With the component board hinged away unsolder the nine fork-ended tags from terminals 27 to 35 on the transformer terminal board.

173. Release the two clamps and the four cheese-headed screws securing the transformer to the front panel and remove.

SPECIFICATION TESTS

Operation of RV1

174. a. Specification: (1) With the charger set for 24V operation and with an input of 25V the limits of adjustment of the regulator output voltage, by means of RV1 shall be as follows:-

Min output - less than 12V

Max output - greater than 15V.

(2) With the charger set for 12V operation an input of 12.5V shall produce an output of 14.4V ±0.2V, RV1 having been previously adjusted under conditions of (1) above to give 14.4V exactly.

b. Method:

(1) Remove the base plate.

(2) Set PLA to 24.

(3) Connect a d.c. source of 25V to PLB.

(4) Connect multimeter set to 30V d.c. range between test points 19 and 21 (positive to 19).

(5) Adjust RV1 to give a minimum reading on the multimeter, this shall be less than 12V.

(6) Adjust RV1 to give a maximum reading on the multimeter, this shall be greater than 15V.

(7) Adjust RV1 to give a reading of 14.4V.

(8) Reduce input voltage to 12.5V and set PLA to '12'.

(9) The reading on the multimeter shall be 14.4V.

Regulation test

175. a. Specification: With low and high input voltages the regulator output voltage, ripple voltage and input current under o/c and full load conditions shall be as follows:-

PLA set to	Input volts	Output loud	Input current (A) maximum	Output volts minimum	Ripple mV maximum
'12'	10.35	o/c	1.5	14.0	200
	10.35	7.5Ω	4.7	10.5	400
	14.5	o/c	1.8	14.4	200
	14.5	7.5Ω	5.3	13.6	400
'24'	20.6	o/c	1.0	14.0	200
	20.6	7.5Ω	2.6	10.5	400
	31.5	o/c	1.4	14.4	200
	31.5	7.5Ω	3.1	13.6	400

b. Method:

(1) With PLA set to '12' connect a d.c. source of 10.35V, in series with a multimeter set to 10A d.c. range to PLB.

(2) Connect a multimeter set to 30V d.c. range between test points 19, (+) and 21 (-) and an oscilloscope between TP3 and 4.

(3) The input current and output voltage as measured on the multimeters and ripple voltage measured on the oscilloscope shall conform with readings given in above table.

(4) Connect a 7.5Ω resistor across TP3 and TP4. The input current, output voltage and ripple voltage shall conform with readings given in above table. Remove 7.5Ω resistor.

(5) Increase input voltage to 14.5V and repeat (3) and (4).

(6) Set PLA to 24 and repeat (3) and (4) with input voltages of 20.6 and 31.5V. With input of 31.5V the duration of the test must not exceed 3 minutes for the on-load condition.

Accidental s/c test

176. a. Specification: With the output of the charger terminated with a load of 0.05-0.1Ω and an input of 12 or 24V the short-circuit current shall be not greater than 2.0A.

b. Method:

(1) Connect a multimeter set to 10A d.c. range between TP3 and 4 (TP4 positive).

(2) Set PLA to 24 and connect 24V to the input socket. The short-circuit current shall be not greater than 2.0A.

(3) Reduce input to 12V and set PLA to 12, the short-circuit current shall be not greater than 2.0A.

Protection circuit test

177. a. Specification: With a d.c. source of 14.5V connected to the output of the charger and with the charger switched off, the current flowing from the d.c. source shall be not greater than 25μA.

b. Method:

(1) Connect a d.c. source of 14.5V with a multimeter in series to TP3 and 4 (TP4 positive).

(2) With the charger switched off, the current flowing from the d.c. source shall be not greater than 25μA.

Full load output test

178. a. Specification: With the output of the charger terminated in a load of 7.5Ω and with an input of 25V d.c. The output voltage measured across the load shall be not less than 13.2V.

b. Method:

(1) With PLA set to 24 connect a d.c. source of 25V to PLB.

(2) Connect a 7.5Ω resistor between TP3 and TP4.

(3) Connect a multimeter set to 30V d.c. range across the 7.5Ω resistor. The output voltage as read on the multimeter shall be not less than 13.2V.

SECTION 6 - ANCILLARIES

Battery, secondary, alkaline, 12V 0.85AH

179. These batteries (6140-99-106-0750) are of the nickel-cadmium type and cannot be repaired. No topping-up is necessary and the only routine maintenance is periodic inspection of the vents and the removal of any corrosion. For this a nylon brush, or a plastic tool should be used. The vent screws should never be unscrewed.

180. The batteries can be charged either by a constant current of 57mA for 21 hours or by a constant voltage of 14.4V with the initial charge current limited to 2A. Charging time from a constant-voltage source is five hours but it should be noted that the batteries are normally 50% charged after 1 hour.

181. The following test shall be applied to a battery to determine its serviceability state. The battery shall be charged for five hours at 14.4V. The battery shall then be discharged for six hours with loads of 2A for one minute followed by 40mA for ten minutes, repeating alternately. Measure the end-of-discharge volts on the 2A load, which must be not less than 10.5V. Any battery which does not satisfy this requirement will be sentenced unserviceable.

EME/8c/2877/Tels

END